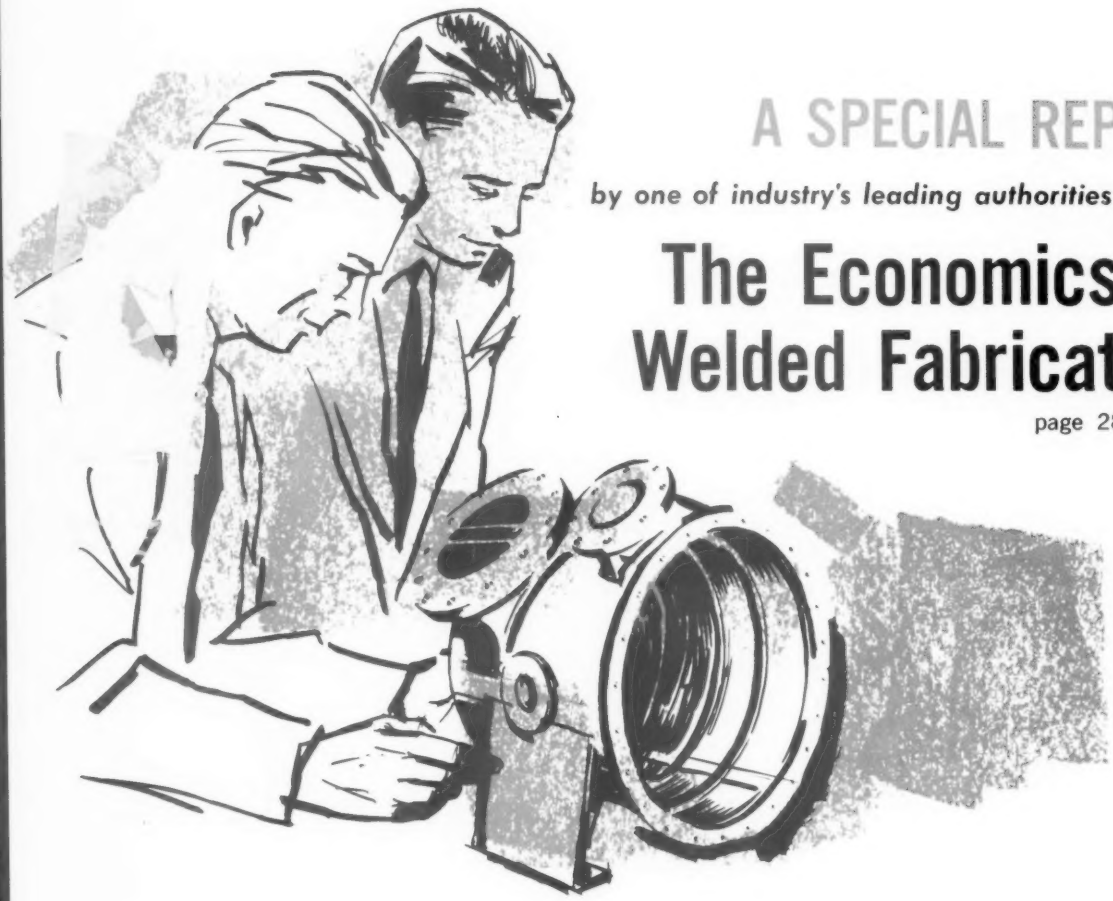
Industry & WELDING

MAY/1959

WELDING MANAGEMENT • PRODUCTION • ENGINEERING



A SPECIAL REPORT

by one of industry's leading authorities on . . .

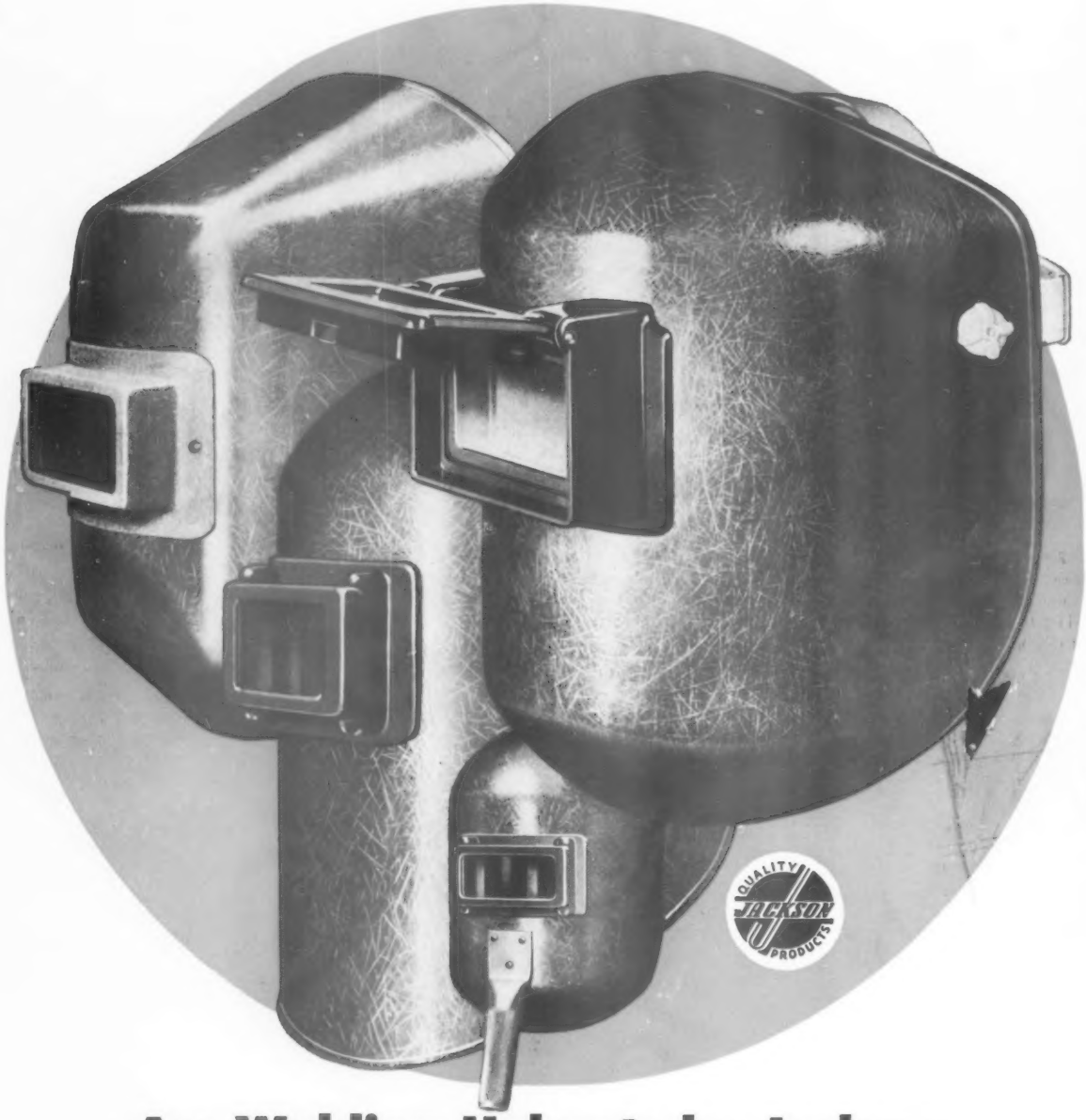
The Economics of Welded Fabrication

page 28

THE MAGAZINE OF WELDED FABRICATION

PUBLISHED BY THE INDUSTRIAL PUBLISHING CORPORATION

Timely, helpful editorial . . . read by more welding men then any other monthly welding magazine



Arc Welding Helmets by Jackson

- MADE OF FIBER GLASS, strong, smooth, easy to clean, resistant to heat and moisture, they last.
- IN THREE STYLES (*left to right*): narrow shell, straight shell and curved shell . . . each of these with . . .
- YOUR CHOICE OF LENS HOLDER (*l. to r.*): metal lens holder, plastic lens holder (insulative and less in weight), and a plastic, insulative lift-tront.
- ADJUST-O-LOK HEADGEAR of non-conductive, lightweight and durable Nylon plastic provides easiest headsize adjustment while being worn. Helmet stop and cross strap are also adjustable.
- CAP-AND-HELMET COMBINATIONS offer choice of three helmet styles, three lens holders, three Jackson safety caps.
- WELDING HANDSHIELLS in the same three shell styles have plastic lens holders, fiber handles.

Sold Everywhere by Better Welding Supply and Safety Product Dealers

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

WARREN • MICHIGAN

For More Information Circle No. 38 on Reader Service Card.

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14 REASONS *this new "Mainliner" gives you more for your money and* MORE PROFIT ON EVERY JOB!

1. **HINGED SIDE PANELS** can be closed and padlocked in place.
2. **LARGE 25 GALLON FUEL TANK** permits extended operations. Fuel pump and fuel level gauge are standard equipment.
3. **CHOICE OF IGNITION:** either magneto with hand crank, or battery self starting systems available.
4. **AUTOMATIC IDLING DEVICE** saves gas.
5. **LONG LIFE FLEXIBLE STEEL COUPLING** has no rubber or fabric to deteriorate.
6. **ENGINE:** Dependable, economical power is supplied by the world famous water cooled 4-cylinder Willys Jeep engine. A diesel engine is also available if desired.

7. **LIGHTWEIGHT** permits quick movement from job to job.
8. **POLARITY SWITCH** lets you quickly change from straight to reverse polarity without danger of burnouts.
9. **110 VOLT DC** outlet supplies 1 KW power to operate lights and tools at the job.
10. **EXCLUSIVE WELDING HEAT CONTROL** permits up to 500 accurate settings. You can select the exact setting for any electrode or any welding position without changing engine speed.
11. **REINFORCED** welding and ground cable terminals.
12. **CONTROLLED COOLING** of all generator parts insures long, trouble-free life.
13. **250 AMP. HOBART BUILT GENERATOR** provides exceptional arc stability in all ranges—helps you do better, faster work under all conditions.

THE NEW "MAINLINER" is just one of the many Hobart welders that is designed to meet exacting requirements. An extremely wide variety of models in many capacities is available to exactly answer your welding needs.

14. *The "MAINLINER" delivers a* HOT FAST ARC *with plenty of engine power*

The "Mainliner" can't be beaten for fast, economical field operations. Here two welders team up to get a pipeline job done in half the time.

200 amp. AC Power/DC Welder Combination

300 amp. DC Welder with 6 or 12 KW AC power

300, 400, 600 amp. Gas Drive Welders

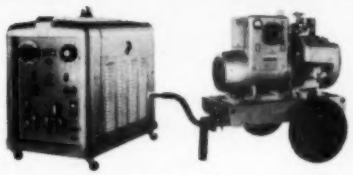
200 amp. DC "Husky Boy"

400, 600 amp. Self-Propelled "Big Wheeler"

NOW YOU CAN DO "Tig" WELDING ANYWHERE!

Here's an ideal combination that lets you do Tig Welding in the field. The Hobart PowerPak connected to the AC/AC power unit gives you all the necessary controls for welding aluminum and special metals by the Tig process.

The lightweight PowerPak unit may be taken to the work and used 100 feet or more from the generator. You can weld in hard-to-get-to locations, without making standard power line connections.



PowerPak *AC/AC Welder & Power*

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Ph. FE 2-1223 *"Manufacturers of the world's most complete line of arc welding equipment"*

Send for this **FREE** *Catalog*

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Please send me, without obligation, complete details on the items I've checked: ☐ *"Mainliner" with gas engine* ☐ *"Mainliner" with diesel engine* ☐ *200 amp. AC Power/DC Welder* ☐ *300 amp. gas drive with 6 or 12 KW power* ☐ *300* ☐ *400* ☐ *600 amp. Gas Drive* ☐ *"Husky Boy"* ☐ *400* ☐ *600 amp. "Big Wheeler"* ☐ *PowerPak for Tig Welding* ☐ *200 amp. AC/AC Combination* ☐ *Electric Drive Welders* ☐ *AC Transformer Type Welders Also send me new catalog on:* ☐ *welders,* ☐ *electrodes,* ☐ *accessories.*

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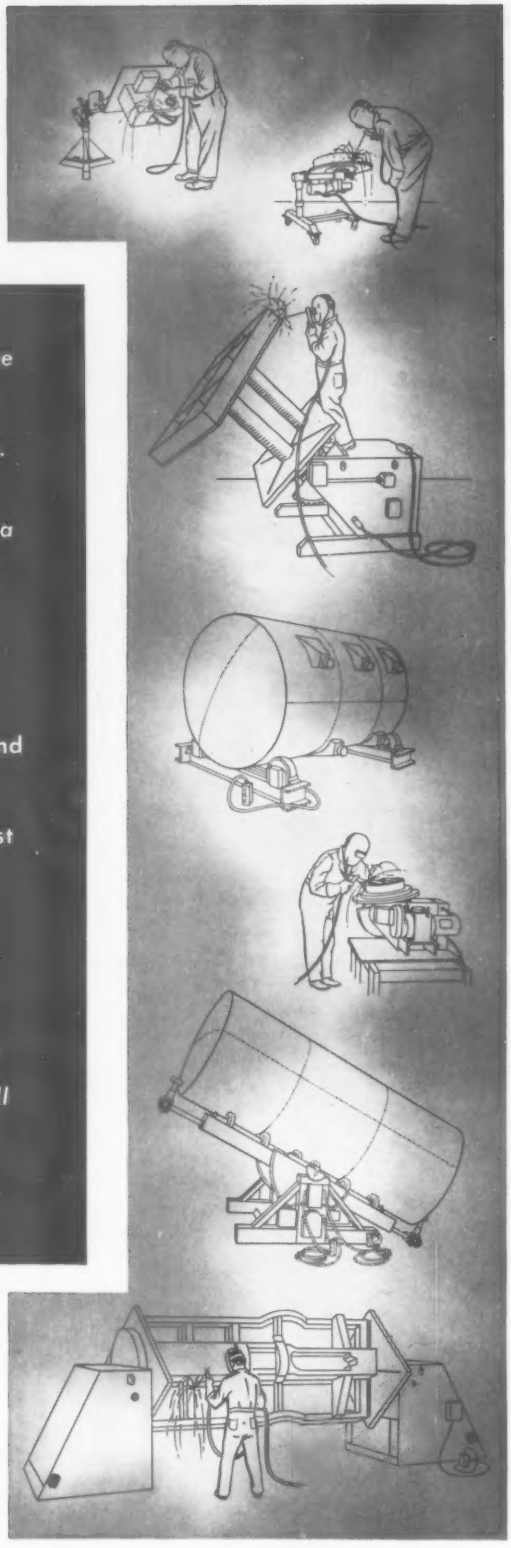

In a board walk the largest item of expense is the lumber; in a splendid violin the least item of expense is the lumber.

In a plain wall the stone is the chief cost; in a piece of classic statuary the cost of the stone is hardly reckoned.

This principle, in a certain degree, applies to the making of a good positioner. We do not pretend that we put more or less material into each Aronson Positioner; but we do put in the best materials, the scientific knowledge and expert skill and the long-continued care which no ordinary positioner contains.

If you want to get rich music or a treasure of the sculptor's art or a job of positioning that will be satisfactory and increase your profits, you must pay for something other than raw material.

UNIVERSAL BALANCE® POSITIONERS
BENCH TURNTABLE POSITIONERS
GEAR DRIVEN POSITIONERS
HEADSTOCK - TAILSTOCK POSITIONERS
TRACTRED® TURNING ROLLS
TURNTABLES
FULLY AUTOMATIC POSITIONERS
MAGNETIC WELDING CLAMPS

Quality POSITIONERS by **Aronson MACHINE COMPANY**
ARCADE, NEW YORK

WORK WORK

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Industry & WELDING
WELDING MANAGEMENT · PRODUCTION · ENGINEERING

COVER

the economics of welded fabrication is proven; cost-conscious designers know this and are applying it.

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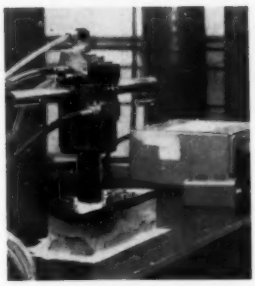

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**FACTS AT YOUR FINGERTIPS:* Use the reader service card bound into this issue to get information on the products on these pages.*

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New Hi-Impact Plastic Insulated Panel Receptacles and Mating Plugs

Now, you can make fast, positive power connections to any metal panel or housing without special insulating materials. Simply punch out a hole and insert a Cam-Lok self-insulated Receptacle! Uses standard electrical lock-nuts, affords "dead-front" protection. Push in and twist Cam-Lok mating Plug and you've made a locked connection, which can be released quickly.

New Cam-Lok Receptacles eliminate costs of special insulating panels and reduce assembly time. Patented, high-pressure contact assures minimum resistance and heating.

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Industry & WELDING

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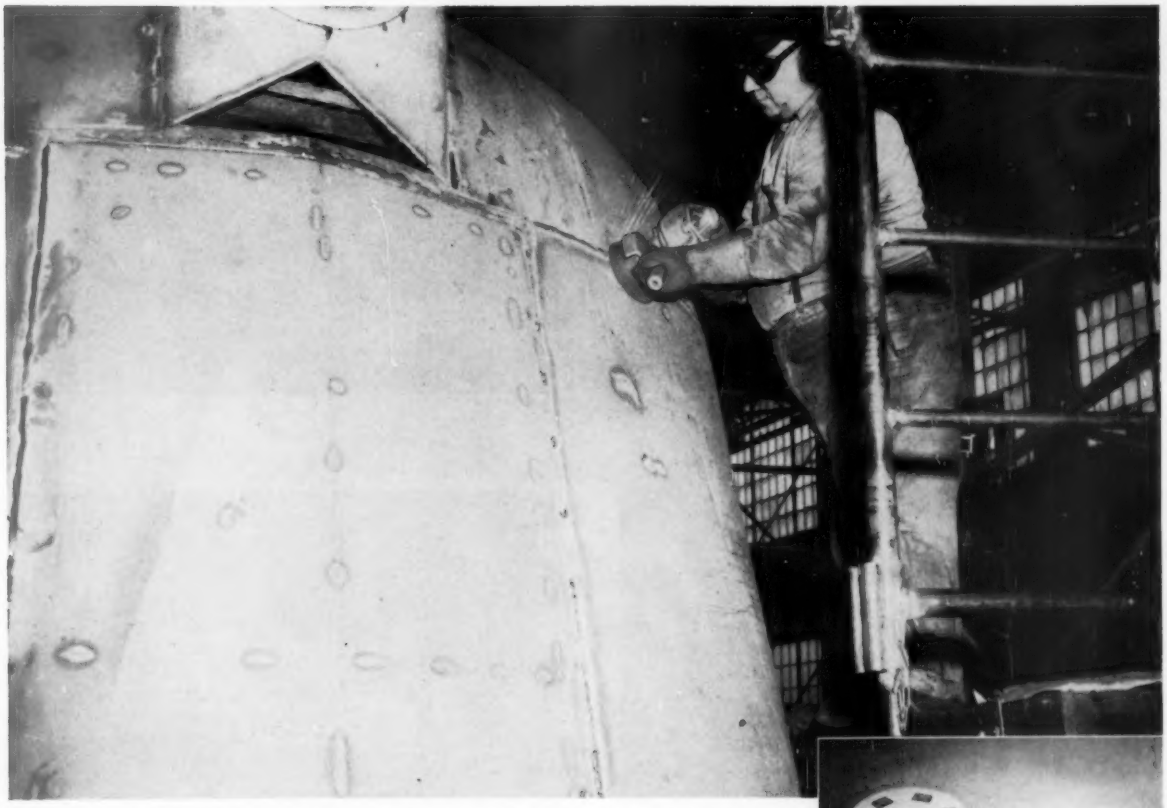
ON THE NOSE!

Norton "44-B11" wheels make the ideal abrasive-and-bond combination for heavy weld grinding



Smoothing Welds on a diesel locomotive's nose section, a Norton flaring cup wheel of 44 ALUNDUM* abrasive-B11 resinoid bonded, is easier on the operator, adds to the diesel's looks, cuts maintenance costs . . . a "Touch of Gold" performance!

Better grinding for less money is the consistent record of Norton wheels combining 44 ALUNDUM abrasive and the B11 resinoid bond — the highest scoring team in the field of weld grinding.

"44" is tougher and harder than other non-premium priced abrasives, cuts faster and cooler and lasts longer.

The B11 resinoid bond results in more uniform, better balanced wheels. They "hug that work" closer with less vibration and bounce . . . are precision duplicated in half-grade increments across the entire hardness scale.

Get more facts on how this outstanding wheel combination can benefit your weld grinding. See your Norton Distributor for complete details and prompt service. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

Built-In Reinforcement is a feature of Norton cup wheels in standard size 6/4 x ¾ x 2". The new steel cup bushing, molded firmly into the wheel back, provides added safety.

W-1913

NORTON ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For More Information Circle No. 51 on Reader Service Card.

WELDING AT WORK

to do the job better and cheaper

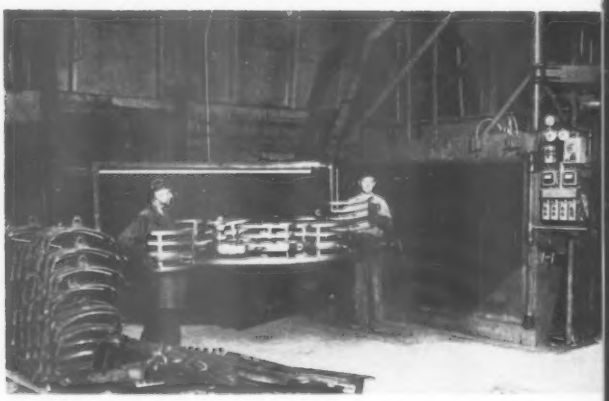
Steel supply firm uses 8-torch cutting machine

LOS ANGELES, CALIF.: One of the West's largest and most accurate flame cutting machines has been installed here at district headquarters of the United States Steel Supply Division of U. S. Steel Corp. The machine can cut steel shapes up to 12-feet wide and 40-feet long from steel up to 12-inches thick.

An electronic tracer makes possible close-tolerance cutting.

Mounted on auxiliary rails to permit greater mobility, the machine's eight motorized torches can cut circles up to 144-inches in diameter and rectangles up to 144- by 480-inches.

Torches can be adjusted to cut straight line beveled edges as smoothly and accurately as perpendicular ones.



Blast cleaning gets weldments ready for painting

NEW HOLSTEIN, WISCONSIN: The Arps Corporation had been using air tools to chip and grind weldments used in earth and snow moving equipment. These weldments vary in weight from a few ounces to about 350 pounds. A vapor operation followed chipping to prepare weldments for painting. The grinding and chipping operations caused dirt and noise and were costly enough to prompt a search for other methods.

A Wheelabrator swing table was installed to replace manual operations. The airless blast cleaning unit is equipped with a rotating work table on which parts to be cleaned are placed. The door, on which the table is mounted, is closed to present the pieces to the hard-hitting abrasive blast.

After several years of operation of the airless blast machine, a company vice president reported these benefits:

Quality of welding had improved. Thorough cleaning showed up imperfections not formerly apparent.

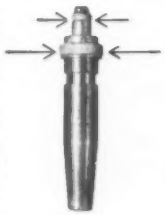
Superior finish for bonding of paint has given longer-lasting and better-looking finishes.

Substantial savings have been effected. It is estimated a return to former methods would increase annual cleaning costs by approximately $28,000.

cutting with
natural gas or propane? **TAKE THE**

FULL SOFT SEAT!

—new Airco 2000 and 2500 Series Hand and Machine Torches



Only Airco gives you full sealing rings of silicone rubber — for high heat resistance, positive durable seal.

Soft seat can withstand rough handling and abuse.

Only 7 tip sizes cover cutting range ⅛" to 12".

Change tips by hand — no wrench.

Triangular stack design of gas tubes in hand torch gives greatest rigidity.

Special oxygen valve permits smooth, ease-on starts required in piercing and cutting.

You've got the *full* soft seat when you use Airco's new premix type 2000 Hand Cutting and 2500 Machine Cutting Torches! Operate with either natural gas, propane, or city gas . . . at low or medium pressure.

Look in the yellow pages of the phone book under "Welding Equipment" for the Authorized Airco Dealer nearest you.

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Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

BIG CAPACITY • Up to 2″ square solids, 3½″ O. D. pipe and tubing, 3″ angle iron, and 4″ channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2″ x 2″ hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

ECONOMY • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

ANGLE CUTS • Optional accessory permits cutting angles up to 45° in either direction.

NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

ALLISON-CAMPBELL DIVISION AMERICAN CHAIN & CABLE

925 Connecticut Avenue, Bridgeport 2, Conn.

ACCO

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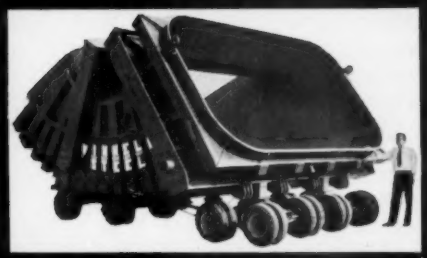
Huge flame deflector is of 1-inch plate V'd out 45° on both sides. P&H AP-100 (E6010) all-position electrodes were used to weld overhead and vertical joints — and DH-5 (E6024) for horizontal and flat fillets.



Completed unit weighs over 50 tons and is 16 ft. wide and 21 ft. high. Special house-moving dollies were required to truck it from Vinnell's Irwindale plant to the base 200 miles away.

giant ICBM flame deflector welded with P&H Iron Powder Electrodes

To weld the giant flame deflector for America's first operational ICBM base at Cooke Air Force Base, Calif., about 7000 lbs. of the newly developed P&H E6010 and E6024 Electrodes were used. Built by Vinnell Steel, the deflector helps to dissipate the terrific heat and thrust generated by the launching of mighty Atlas missiles.

The faster deposition, superior weldability, and ease of handling of the P&H high-speed electrodes held manual welding time to 2000 hours. All welds met the exceptionally rigid requirements of the U. S. Corps of Engineers for X-ray quality and strength — were produced with a minimum of spatter and stub loss.

P&H Electrodes can cut your welding time, reduce electrode cost, and practically eliminate post-welding cleaning and chipping of weldments. Write for Bulletin R-29, which gives full description and specifications data. Address Dept. 306C, Harnischfeger Corp., Milwaukee 46, Wisconsin.

OUR 75TH YEAR

P&H

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WELDERS · ELECTRODES · POSITIONERS

National Welding Supply Association Meets In Frisco

"Lowering Distribution Costs Through Increased Efficiency" is the theme of the NWSA's 15th annual convention

Lockley

Wimmer

SAN FRANCISCO, CALIFORNIA: The National Welding Supply Association will hold its 15th annual convention here at the Fairmont Hotel on May 4 through 6.

The convention opens officially the afternoon of Monday, May 4, but is preceded by a meeting of Officers and Directors on Sunday evening, May 3.

On Monday night, May 4, a reception will be held to honor the out-going president, Leslie P. Beaver, Jr., Beaver Welding Supply Co., Memphis.

On Tuesday, May 5, a business session in the morning will be followed by the Association's annual Contact Booth Program. Seventy-five manufacturers will have booths.

Tuesday evening will feature a reception and then a banquet and dance. The convention will conclude on Wednesday morning, May 6, with a general business session.

Four outstanding speakers will speak at the business sessions. "A Management View of Marketing" will be discussed by Lawrence C. Lockley, Dean of the School of Commerce, University of Southern California. "The Story of the Atlas" told by William L. Young, operations manager, Convair Astronautics Division of General Dynamics Corp., will explain the part welding plays in our nation's missile program.

Other speakers include S. S. Inch, vice president of Kaiser Aluminum and Chemical Corp., and Edward Wimmer, vice president of National Federation of Independent Business.

Vern K. Miller of H. K. Miller, Inc., Chicago, will speak on the subject of "Creative Selling of Arc Welding Machines."

Another part of the business sessions will feature a panel discussion on lowering costs and increasing efficiency of office procedures, warehousing, trucking and sales. The panel will include H. R. McGarvey, H. R. McGarvey, Inc., Pekin, Ill.; Albert C. Earlbeck, Earlbeck and Landrum, Baltimore, Maryland; T. Barrett Quinn, Harvey Company, Greensburg, Penna., and J. K. Calhoun, Bastian-Blessing Company, Chicago. President Beaver will be the moderator.

RETRACTABLE ROOF is the big feature as . . .

Pittsburgh Uses Welded Stainless In New Auditorium

PITTSBURGH, PENNA.: A dome-shaped structure, with each of its eight leaves sheathed in stainless steel, the roof of the new Pittsburgh Public Auditorium will be the largest retractable roof of its type in the world. Six of the leaves of the roof are moveable, operated electrically at the press of a button. Three on each side will slide back over the two stationary leaves, opening three-quarters of the Auditorium to the skies.

The dome is designed as a batten roof. As the battens go toward the roof peak, they taper in about six-inches in every 15-feet. At the last 50-feet from the center, the dome sheath will be welded at the seams and a false batten cap will be used at the weld lines to preserve the batten appearance.

OSU Course On Welding Fundamentals

COLUMBUS, OHIO: A two-week summer conference on the fundamentals of welding engineering will be held from June 15 through 26 by Ohio State University. No specific prerequisite training nor experience is required for registration in the course which will cost $150.

Full information and registration forms can be obtained by writing William L. Green, Department of Welding Engineering, Ohio State University, 190 West 19th Street, Columbus 10, Ohio.

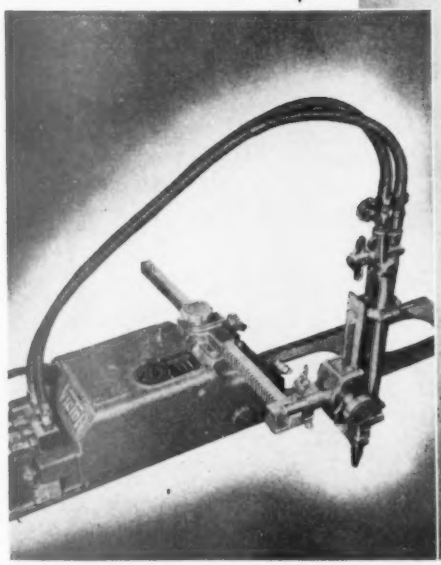
more news on page 13

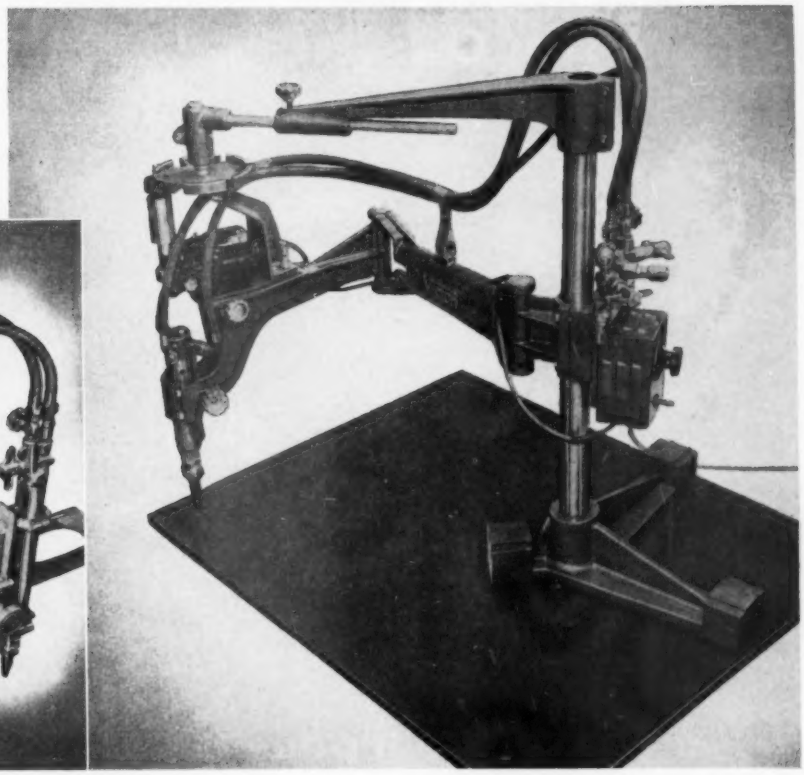
SPEED YOUR PRODUCTION

with these Victor Cost-Cutters

DUPLICUTTER MODEL DC-2000
For cutting shapes →

FLAME CUTTER VU-120
For straight and circle cutting ↓





Victor Flame Cutter, Model VU-120

- Cuts straight lines, square or bevel kerfs, circles to 96" diameter.
- Adaptable to submerged or inert arc automatic welding.
- Travels 0 to 180" per minute forward or reverse; variable speed transmission provides full power over entire range.
- Free-wheeling neutral for easy positioning.
- Accommodates both 2 and 3-hose torches, with or without gear rack.
- Second torch holder available for parallel cutting.

Victor Duplicutter, Model DC-2000

- Duplicates shapes up to 19½" diameter circles, 12" x 35" rectangles.
- Holds tolerances of plus or minus 1/64" in 2" steel.
- Templates easily changed, making practical both long runs or a single copy.
- Weight, 36 lbs. — easily carried.
- Magnetized feet set on stock being cut — no levelling needed.
- Uses Victor cutting tips thru size 5.

To see how Victor Cutting Machines can speed your production, ask your Victor dealer for a demonstration . . . or write us for descriptive Bulletin 353.

VICTOR® for cutting

Profitable dealerships open in a few areas; inquire now.

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; high pressure and large volume gas regulators; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

56

844 Folsom St., San Francisco 7 • 3821 Santa Fe Avenue, Los Angeles 58
1145 E. 76th St., Chicago 19
J. C. Menzies & Co., Wholly-Owned Subsidiary

For More Information Circle No. 69 on Reader Service Card.

HARRIS

universal pressure welding torch No. 43 and the No. 49 cutting attachment

outstanding features:

All welding assemblies and cutting attachments operate on *less than 1 pound* of Acetylene, permitting complete withdrawal of all the gas.

Safer . . . virtually impossible to back oxygen into acetylene line.

Exceptional Flame Stability, due to unique mixing principal.

MAKE US PROVE THESE STATEMENTS

Call your nearest Harris Distributor for a Demonstration—or write to us.

HARRIS

HARRIS CALORIFIC CO.

5501 CASS AVE. • CLEVELAND 2, OHIO

For More Information, Circle No. 33 on Reader Service Card.

STAINLESS STEEL

welding scale and oxide go off with

OX-OFF

LIQUID CHEMICAL FORMULA 536

Costs far less than obsolete hand methods.

No more costly, time-wasting hand compounding, grinding and sanding. OX-OFF 536 acts *in seconds.* Just dip small stainless steel pieces in 140°F bath — OR stroke large pieces with electric applicator (below) . . . welding scale and oxidation go fast and completely from surfaces and crevices.

ELECTRIC APPLICATOR

For large assemblies where dipping is impossible. Operates on 110-120 VAC, 50-60 cycles.

Write for Tech Bulletin IW-5 or see your welding distributor.

Chemclean Products Corp.
15-08 121 St., College Pt. 56, N. Y.

MANUFACTURERS OF INDUSTRIAL CHEMICALS AND SPECIALTIES

Circle No. 20 on Reader Service Card.

"LITTLE HUGH-TEC" is introduced here by glamorous Greta Thyssen, stage, screen and TV star who is "Miss Weldor of 1959." This cartoon figure is a symbol created by the famous French poster artist, Savignac, especially for Eutectic Welding Alloys Corp., Flushing, New York. The new character will be broadly promoted in the company's trade and business advertising.

Industry & Welding Appoints Eastern Editor

New Eastern Editor for INDUSTRY & WELDING is **Henry Lefer.**

Lefer

He was editor of AERONAUTICAL PROCUREMENT and prior to that was with AVIATION WEEK for seven years. He holds a BS from City College of New York and studied engineering at N.Y.U., has more than 10 years experience writing about technical and engineering subject, including resistance welding and brazing of honeycomb structures for aircraft and missile applications.

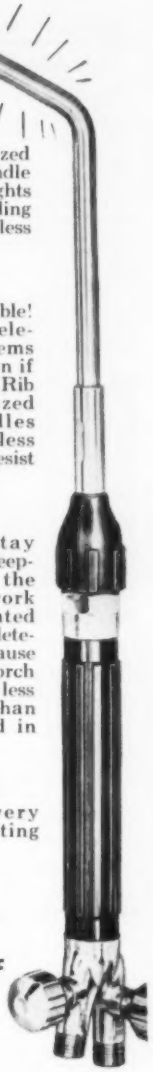
Welding Supply Dealer Dies

Mary E. Tullis Smith, owner of H. I. Tullis Welding Supplies, Long Beach, California, died on March 28th of a heart attack. She was an active member of NWSA since 1949.

Two sons, Phil and Dick Tullis, have joined the firm and will continue its operation. Gordon S. McGowan, Jr., is manager.

continued on page 71

WHY THIS TORCH SPEEDS WELDING 3 ways!



1 LIGHTER . . .
high strength anodized aluminum alloy handle reduces torch weights by one-third. Welding is done faster, with less operator fatigue.

2 STRONGER . . .
and more dependable! Spring loaded, telescoping valve stems are protected even if torch is dropped. Rib reinforced, anodized aluminum handles with tough stainless steel torch heads resist wear-damage.

3 COOLER . . .
torch handles stay comfortably cool, keeping operators on the job with fewer work breaks. Over-heated handles are completely eliminated because the stainless steel torch head is seven times less heat conductive than brass heads used in other torches.

4 MODELS

A model for every welding and cutting need.

- *Super-Jet*
- *Aero-Jet*
- *Star-Jet*
- *Jet-O-Matic*

WRITE NOW for illustrated catalog.

MARQUETTE

MANUFACTURING COMPANY, INC.
307 E. Hennepin Ave.
MINNEAPOLIS 14, MINNESOTA

Circle No. 45 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

Bassarear

Heyde

Jenkins

Hardy

Neiley

APPOINTMENTS:

Ed Still has been named sales representative in the San Francisco District by *Linde Company, Division of Union Carbide Corp.*

Milwaukee Electric Tool Corp. has transferred three of its sales representatives to new assignments. They are **Jim Bassarear**, Milwaukee district; **Pete Heyde**, New York, and **Jim Jenkins**, Minnesota, North and South Dakota.

Jeffers

Chamberlain

William R. Jeffers has been named Cincinnati District sales manager by *Liquid Carbonic Division of General Dynamics Corp.*

R. N. (Ron) Chamberlain has joined the sales staff of *Fibre-Metal Midwest, Inc.*, Chicago, and has been assigned to cover the North Central States.

The American Platinum & Silver Division of Engelhard Industries, Inc., has named **Eugene G. Evans** as Division Sales Representative in the brazing and industrial field in New England.

Harold Mendenhall has been appointed technical sales engineer in the sales department of *Smith Welding Equipment Corp.*

J. C. Ruptic has been appointed a sales representative for *A. O. Smith's Welding Products Division* in Kane, LaSalle, Kendell, DuPage, Grundy and part of Cook counties in Illinois.

G. R. Whitlow has been named manager of export sales for *Hobart Brothers Co.*, Troy, Ohio. He will be responsible for the sale of all welding equipment for export.

Alloy Rods Company, York, Pa., has assigned five sales representatives who have just completed the company's six month training program. They are **Eugene F. Weisser**, Philadelphia; **Fred J. Rex, Jr.**, Pittsburgh; **Robert M. Alexander**, and **Robert F. Mann**, Chicago, and **Weldon E. Spangler**, Houston.

Hardwicke L. Browne has been appointed sales manager, Welding Products, International Division of *Harnischfeger Corp.* He will handle foreign sales of P&H welders, electrodes and positioners.

All-State Welding Alloys Corp. has added two salesmen who will call on the refrigeration industry in the East. They are **Allen B. Harvey** and **Tony DeChiara.**

Thomas J. Cunningham has joined the sales force of *O.K.I. Welding Supply Co.* of Cincinnati, Ohio, and will represent that company in northwestern Ohio.

Metal & Thermit Corp. has announced the appointment of **Leonard W. Mawhinney** as executive advisor to the president. He had been with *Ford* and *Continental Can Co.*

John A. Houston has been named general manager of the Dallas, Texas, plant of *Joseph T. Ryerson & Son, Inc.*, steel and aluminum distributor.

PROMOTIONS:

Warren L. Hardy has been appointed manager of marketing research for abrasive products at *Norton Company.* He was formerly manager of business research.

Sperry Products, Inc., has announced the promotion of **Richard Y. Neiley** to the post of assistant industrial sales manager.

August F. Michelini has been named a vice president of *Tec Torch Co., Inc.*, Carlstadt, N.J. Announcement was made by **Edward Andriola**, president.

Lawrence H. Kissler has been appointed supervisor of distributor sales in the Salt Lake City District by *Linde Company, Division of Union Carbide Corp.* He had been a sales representative in the same office.

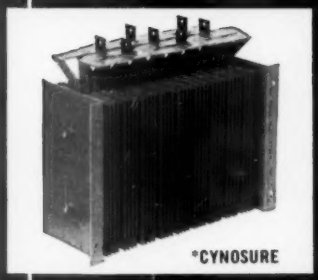
RETIREMENTS:

Orello S. Buckner, one of the three founders of *Bay State Abrasive Products Company*, Westboro, Mass., has officially retired from all active participation in the company's operation. He remains as Chairman of the Board of Directors.

Ever since the company was organized in 1922, Mr. Buckner had been its president, a position he relinquished in June, 1958.

continued on page 16

THIS HELPS MAKE THE DIFFERENCE



*CYNOSURE

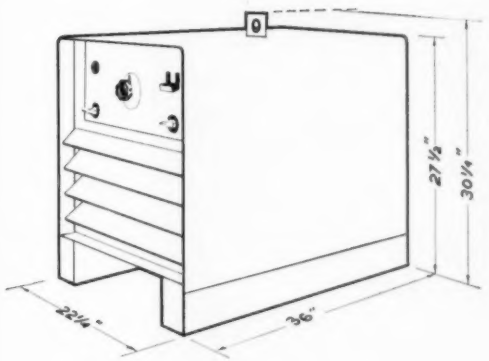
THAT MAKES the Miller GOLD STAR SR the GREATEST . . .

. . . rectifier type welder ever created!

Small illustration above shows the Miller-designed, Miller-built semi-metallic rectifier stack that combines with a new transformer and new weld stabilized circuit to set the Gold Star SR line of welders above and apart from all others; that has earned for them the reputation among professional weldors of being the world's best performing, longest lasting machines of their type.

Built to withstand the most demanding industrial d-c welding applications, including carbon arc service, this series is available in four basic models with 60% duty cycle ratings of 200, 300, 400 and 600 amperes. Duplex models to 1200 amperes. Shown to right is line drawing of the "horizontal" model for use where space is limited, or for outdoor use.

Complete particulars will be sent promptly, or a demonstration by your local distributor will be arranged at your convenience.



miller ELECTRIC MANUFACTURING COMPANY, INC.

APPLETON, WISCONSIN

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal
EXPORT OFFICE: 250 West 57th St., New York 19, N. Y.

*CYNOSURE: Anything to which attention is strongly turned; a center of attraction.

For More Information Circle No. 47 on Reader Service Card.

MEN ON THE MOVE

continued

ELECTIONS:

McBurney

Long

L. L. McBurney, president of *Smith Welding Equipment Corp.*, Minneapolis, was elected president of the *International Acetylene Association* at the group's 61st annual convention in New Orleans last month. McBurney joined Smith in 1925 and served as general manager and sales manager before becoming president in 1949. He had been a vice president of the IAA.

T. S. Long was elected president and general manager of *Taylor-Winfield Corp.* at a recent Board of Directors meeting. He succeeds **J. Denton Anderson** who became Chairman of the Board and chief executive officer.

William W. Jetter, president of *Mid-States Welder Mfg. Co.*, announces the following elections: **George W. Cross**, vice president of operations, and **Otto E. Fenske, Jr.**, vice president of sales.

DEATHS:

It is with deepest regrets that *Eutectic Welding Alloys Corp.*, Flushing, N. Y., announces the death of **W. Sigmund**, executive vice president, on February 28. Mr. Sigmund has been with Eutectic for the past 17 years. He had extensive knowledge of international banking and finance and took an active part in the worldwide operations of the company.

Sigmund

Raymond F. Sherwin, 60, manager of the *Welding Rod Division of the Chicago Hardware Foundry Co.* and a member of the board of directors, died in Waukegan on March 9 after a long illness. He is survived by a son, John J., and a brother, Frank J., president of Chicago Hardware Foundry Co.

SALES MEETINGS:

Attending an Eastern Regional conference held by *Messer Cutting Machines, Inc.*, New York City, are **Evan A. Johnson, Jr.**, **Henry Keep, Jr.**, and **Richard Deily** of Messer and **William Donoho**, *Southern Oxygen Co.*, and **Rudy Kleine**, *C R O Engineering.*

SMS CORPORATION

Headquarters for Resistance Welding Supplies

R.W.M.A. Classes of alloys in castings, forgings and bar stock; copper tungsten alloys

Standard electrodes; special electrodes and fixtures designed and built

All types of straight and offset holders

Welder wheels in all alloys and sizes

Tip dressers, reamers and contour dressers

Adjust-A-Pressure holders (above, left) used with Adjust-A-Angle adapters solve many welding problems; change from one electrode spacing to another — a matter of minutes — with the same set-up.

S-M-S CORPORATION

8605 LIVERNOIS AVENUE • DETROIT 4, MICHIGAN

For More Information Circle No. 55 on Reader Service Card.

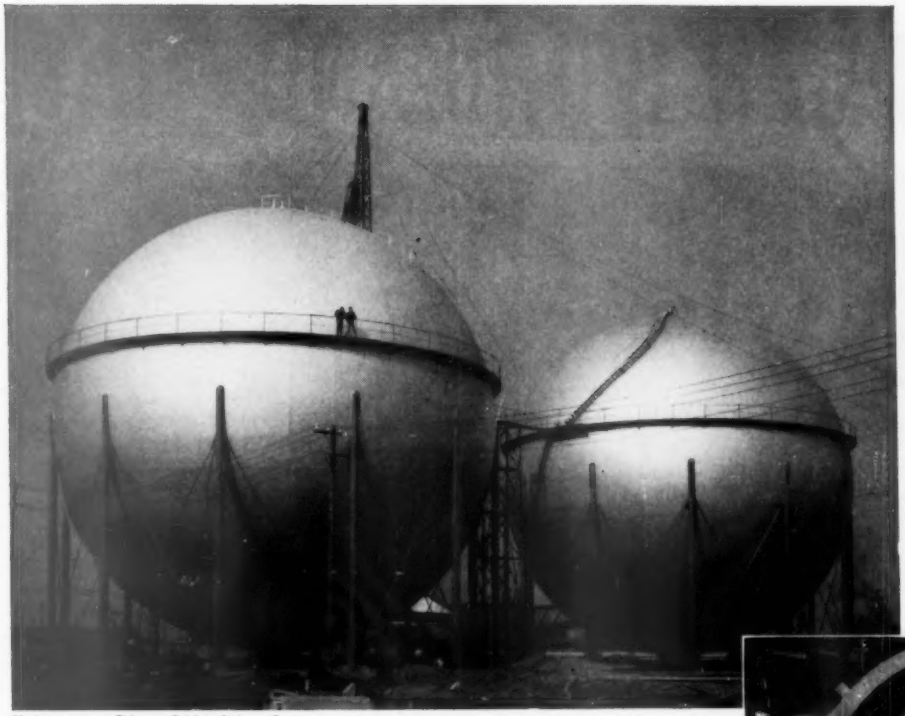


Photo courtesy Chicago Bridge & Iron Co.

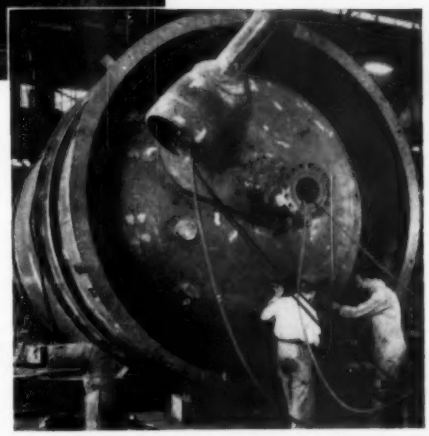


Photo courtesy Baldwin-Lima-Hamilton Corp.

When there's no margin for error...specify

ATOM-ARC ALLOYS

FOR WELDING

Low Alloy or High Strength Steels

With continually increasing fabrication costs, you can't afford a *margin for error*. Successful fabricators specify the inherent qualities of all position iron powder low hydrogen Atom Arc electrodes to reduce the unnecessary rework that chews up profits and delays jobs.

Inspection by X-ray is a requirement for most fabrications involving low alloy or high tensile steels. There is an Atom Arc alloy with the right physical properties and chemistry for welding most low alloy or high tensile steels. An electrode that deposits X-ray sound weld metal, increases the efficiency of your welding operation and lowers your costs. For complete details write for the "Handbook for Welding Low Alloy High Tensile Steels," Alloy Rods Company, Dept. 01, P. O. Box 1828, York, Pennsylvania.

Atom Arc 7018 Mo
AWS-E7018-A1

Atom Arc 8018 N
AWS-E8018-C2

Atom Arc 8018 CM
AWS-E8018-B2

Atom Arc 9018 CM
AWS-E9018-B3

Atom Arc 10018 MM
AWS-E10018-D2

Atom Arc 12018 NMV
AWS-E12018-G

Atom Arc T
AWS-E11018-G

Alloy Rods Company

YORK, PENNSYLVANIA • EL SEGUNDO, CALIFORNIA

QUALITY WELDING ELECTRODES FOR
Stainless Steel
Low Alloy Steels
Cast Iron
Tool Steel
Bronzes & Dissimilar Metals
Hard Surfacing Electrodes & Wires

NO FINER ELECTRODES MADE . . . ANYWHERE

For More Information Circle No. 3 on Reader Service Card.

NOW YOU CAN GRIND AND FINISH

NEW BAYFLEX DOUBLE-DUTY

Illustrations above show Bayflex Double-Duty in action, held at correct angle for weld bead grinding (top) and for finishing (bottom)

For More Information Circle No 15 on Reader Service Card.

WITHOUT CHANGING WHEELS!

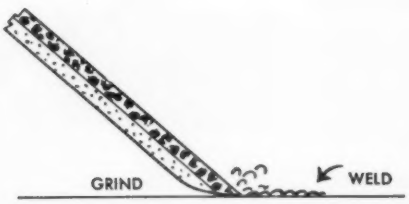
IS 2 WHEELS IN 1

There are two important angles to consider before you buy new weld-grinding or finishing wheels. Bay State's new Bayflex Double-Duty raised hub disc-wheel has them *both!*

The "DD's" unique, two-layer construction gives you two grinding angles: One is 30° - 45° which gives you fast stock removal for grinding weld beads . . . and the other is 10° - 20° which gives you a finish without gouging, a finish so smooth it's just short of a polished surface.

The upper layer for weld grinding comes in a single, standard specification. The lower finishing or blending layer comes in your choice of five different grits (24, 36, 54, 80 and 120) for every type of finishing job from heavy steels through light stainless sheets to aluminum and copper.

Your Bay State representative is ready now to demonstrate the Bayflex Double-Duty in your plant under normal working conditions. Get in touch with him and see what he can do to cut costs and speed up your weld grinding. You'll find he's more than a good salesman . . . because he's an experienced abrasive specialist, too. *Better grinding at lower cost . . . that is his business.*



Upper layer removes stock rapidly when disc is held at 30° - 45° angle.

Lower layer smooths and blends surface when held at 10° - 20° angle.

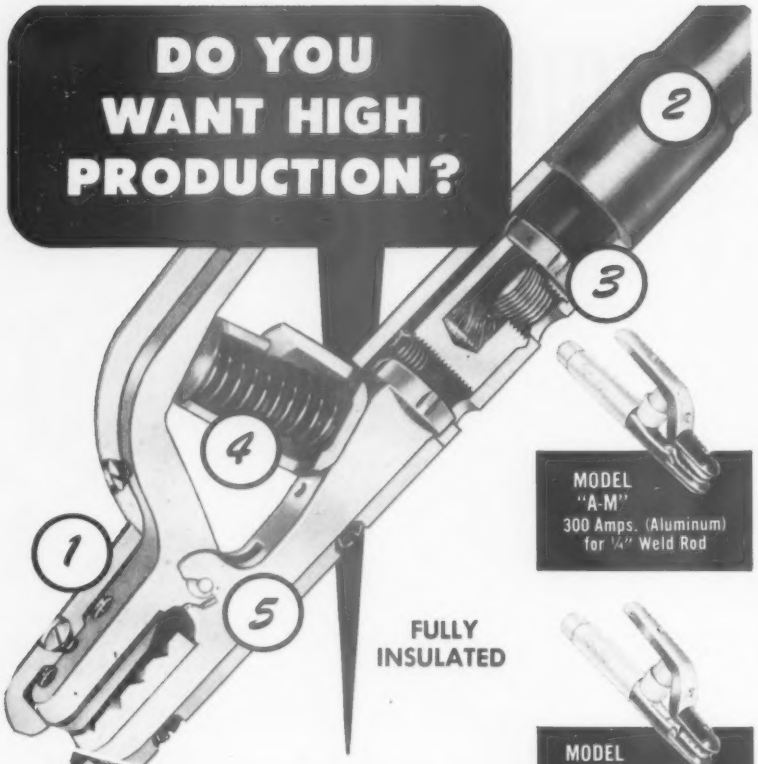
BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Mass.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles.
Distributors: All principal cities

For More Information Circle No. 15 on Reader Service Card.

DO YOU WANT HIGH PRODUCTION?



FULLY INSULATED

MODEL "A-M" 300 Amps. (Aluminum) for ¼" Weld Rod

MODEL "C-S" 250 Amps. (Copper Alloy) for 7/32" Weld Rod

MODEL "C-M" 300 Amps. (Copper Alloy) for ¼" Weld Rod

MODEL "C-L" 500 Amps. (Copper Alloy) for 3/8" Weld Rod

SuperGrip™ PRODUCES

more work, safer, easier!

SuperGrip Electrode Holders are designed to make easy all operations in welding...from attaching Holder to cable on through to depositing weld metal in any welding position!

YOU GET MORE out of *Super-Grip* for these reasons:

1 RUGGED, LONG WEARING interchangeable jaw insulators are easily replaced *QUICKLY*. Jaw pads of the aluminum Model "A-M" are easily replaced.

2 EXCLUSIVE NECKED-DOWN HANDLE cuts "cable fatigue" and "down time" by reducing cable play at handle end and close to cable connection...prevents fraying and fatigue of wire strands... makes *SuperGrip* firmer, handier working tool.

3 BALL POINT SET SCREW of "man-size" diameter really *grips* cable tightly...can be tightened without removing handle...provides maximum current-conducting cross section...minimizes re-connections to save time.

4 POWERFUL COMPRESSION of enclosed spring puts extra "bite" in *SuperGrip* jaws...minimizes electrode waste or loss.

5 PERMANENT PIVOT BUSHING in tongue of trigger assures alignment, minimizes wear and increases service life of the Model "A-M" Aluminum Holder. Positive grip helps produce more... better work.

Get our Bulletin No. 65 or...
Ask your Welding Distributor!

The FIBRE-METAL Products Company | CHESTER PENNA.

In CANADA: Fibre-Metal (Canada) Limited, Toronto

For More Information Circle No. 27 on Reader Service Card.

LIBRARY

of welding

WELDING HANDBOOK

Welding Handbook, Section II, Gas, Arc and Resistance Welding Processes, edited by Arthur L. Phillips, cloth bound, 550 pages, published by American Welding Society, 33 West 39th Street, New York 18, N.Y.; price: $9.00.

The Second Section of the Fourth Edition of the Welding Handbook covers gas, arc and resistance welding processes and includes a chapter on standard welding symbols.

The volume contains over 550 pages, 13 chapters, 845 illustrations and nearly 100 tables. Each chapter has its own bibliography; reference is simplified by a very comprehensive index.

A chapter is devoted to each process, or group of processes, and each group is followed by a chapter describing the equipment. The treatment of the arc welding process, for example, includes chapters on carbon-electrode arc welding, shielded metal-arc welding, inert-gas metal-arc welding and submerged arc welding as well as a single chapter describing bare metal-arc welding, impregnated-tape metal-arc welding and atomic hydrogen welding. This group of chapters is followed by a chapter on arc welding equipment which covers the machines and equipment used for all the arc welding processes described.

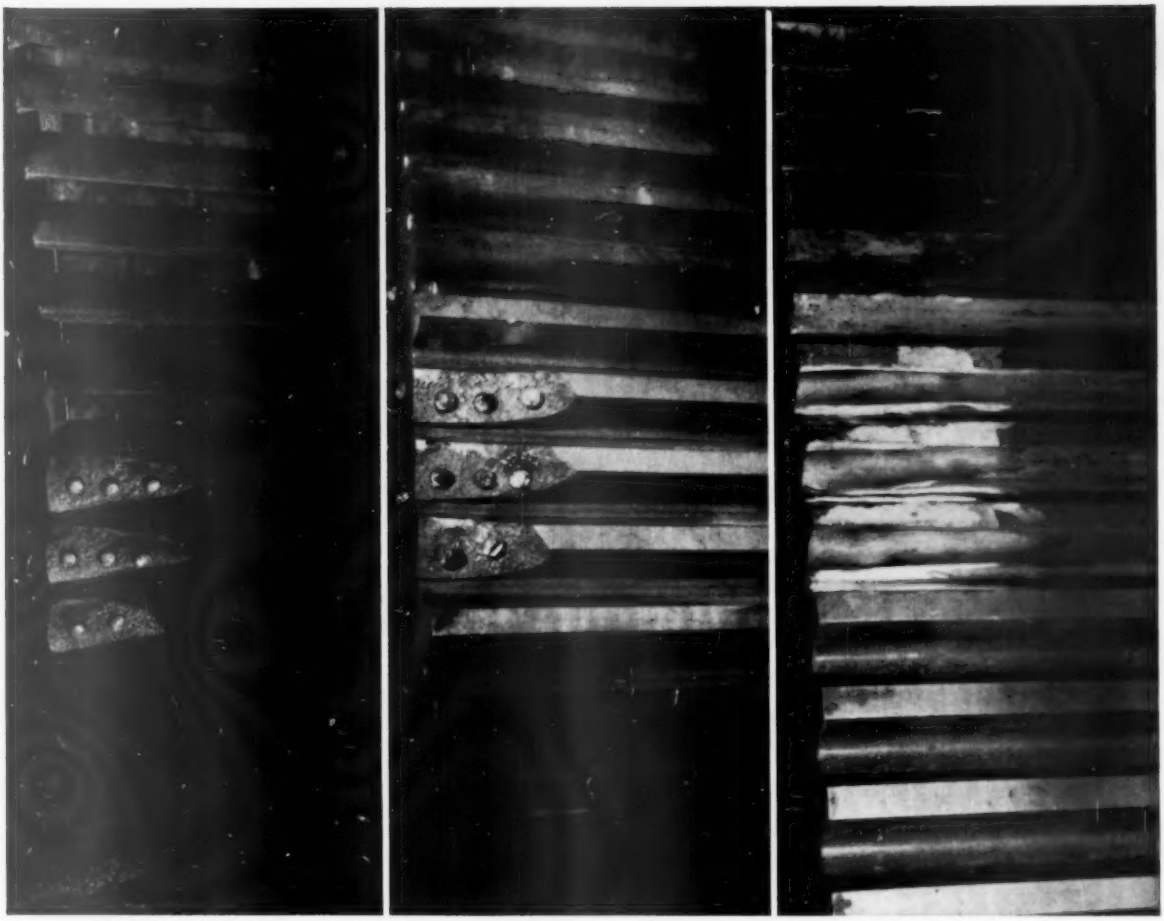
An entire chapter is devoted to welding symbols, the shorthand of the welding industry.

WELDING PLANS FOR FARM EQUIPMENT

"Farm Equipment Welding Plans for Farm and School Shop" is a 90-page, 8½- by 11-inch booklet; published by James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Price 50 cents postage-paid in U.S.A., 75 cents elsewhere.

The James F. Lincoln Arc Welding Foundation has published this new booklet containing 44 plans for making a variety of farm equipment. The booklet contains in convenient handling and filing form project plans previously available as single sheets. The plans with details, pictures, bills of materials and suggestions explain how to make equipment for farming, handling livestock, trailers of several varieties and shop tools. All of the equipment has actually been constructed in either farm or school shops. Plans were prepared by the Vocational Agriculture Service of the University of Illinois.

continued on page 22



Broken teeth are drilled... **tapped and studded...** **welded with Ni-Rod "55", ground to size**

Repair with Ni-Rod "55" Electrode saves 13-ft cast iron mill gear

. . . saves $2000 new gear cost
. . . saves tough replacement job
. . . saves $8000 per day down time

Again, Ni-Rod "55"* Electrode turns a huge problem into a relatively small repair job. The 13-ft cast iron gear in the pictures above turns a power station coal pulverizing mill. One day, its pinion gear shaft broke – and stripped off three teeth before the mill could be shut down.

Replacement was impractical—meant making a gear-sized hole in a thick concrete wall, purchase of a new $2000 cast gear, and a long wait costing $8000 per day.

Repair was the answer– in 5 hours, weldors studded the teeth to improve the foundation; built up a Ni-Rod "55" deposit; ground the deposit to size. Cost – about $230. Today, after more than two years of service, there's no sign of failure.

Ni-Rod "55" Electrode helps you make solid repairs in cast irons – solid production welds, too. Rarely do you need preheat to get sound, strong, machinable joints.

Booklet *"Repair Cast Iron Parts Quickly and Easily"* shows how other shops have pared costs on repairs and production. Yours for the asking, from Inco.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO WELDING PRODUCTS

ELECTRODES • WIRES • FLUXES

For More Information Circle No. 37 on Reader Service Card.

Ranite Hardsurfacing Rods

are *So economical*

they're preferred by the men who pay the bills!

MEN RESPONSIBLE FOR COSTS—men who must hold expenses in line and show a profit—have seven important reasons for preferring Ranite metallic-coated hardsurfacing rods:

1. Longer wearing parts—reduced downtime—increased production.

2. Repair costs reduced—Ranite-coated surfaces can be cut with oxy-acetylene torch when necessary for repair.

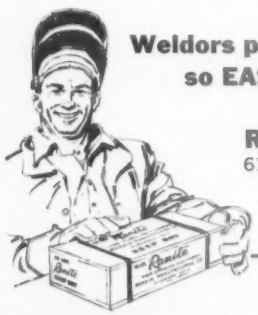
3. More than 80% recovery rate—no unnecessary flux in Ranite coating, maximum amount of coating enters the weld, no slag formed.

4. Rapid deposition rate—maximum metal deposited per man-hour. No splatter loss.

5. Minimum tendency to check—Ranite rods are alloyed with coefficient of expansion and contraction approximating that of parts to be hard-surfaced.

6. Deposits firmly bonded to base metal—Ranite can be applied to all steels, most cast irons and manganese steel *without* stainless bonder.

7. Smaller inventory needed—just five Ranite rods handle the great majority of all jobs. (Types A, BX, C, D and No. 4.)



Weldors prefer Ranite Rods because they're so EASY TO USE. Ask *your* weldors!

RANKIN MANUFACTURING CO.
616 S. Marengo Ave., P. O. Box 631, Alhambra, Calif.

Sold through your local Ranite Distributor

Originators and pioneers of metallic-coated rods—since 1938

Ranite
WELDORS' NO. 1 CHOICE FOR HARDSURFACING

For More Information Circle No. 53 on Reader Service Card.

WELDING LIBRARY *continued*

THE GRINDING WHEEL

"The Grinding Wheel", 1959, revised by William F. Schleicher. Published by the Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio; 32 chapters; 532 pages; $4.95.

This thoroughly revised and updated edition of "The Grinding Wheel" discusses grinding wheels, grinding machines and grinding operations from a basic, as well as a practical, working standpoint.

From the opening chapters which discuss abrasive materials, wheel shapes and sizes, bonds and wheel manufacture, through the entire range of abrasive operations, covering not only metalworking, which comprises the largest part of the book, but the grinding of ceramics, glass, marble and concrete, all conceivable major grinding operations have been covered. The practical aspect has been stressed throughout the book, with many hints for efficient grinding, wheel selection and trouble shooting.

The current, revised edition is based on the 1951 edition, greatly expanded with much added information. It contains over 100 pages of new material. Four new chapters have been written: Mounted Wheels, Reinforced Wheels, Automation and Advanced Mechanization and Safety.

Important changes have been made in almost every chapter of the book reflecting the advancements made in the art of grinding since the publication of the original work in 1951 by Kenneth B. Lewis. Noteworthy additions have been made in the chapters on: The Abrasive Materials, Disc Grinding, Roll Grinding, Costs, Evaluation of Surface Quality, etc.

Each chapter has been reviewed by experts in each field and the book is as up-to-date as possible in this swiftly changing technical world. Included in this group were D. S. Saurman, Simonds Abrasive Co.; E. W. Farmer, Bay State Abrasive Products Co.; J. A. Mueller, Carborundum Company; W. G. Pinkstone, A. P. de Sanno & Son, Inc. A. T. Dalton of Chicago Wheel & Mfg. Co. is chairman of the Grinding Wheel Institute's Public Relations Committee.

One of the most valuable sections in the book is a trouble shooting chart and a wheel selection chart. In the former are discussed, in eight pages, the majority of troubles which beset the grinding operator with the corresponding correction leading to the elimination of the trouble. The detailed, 16-page wheel selection chart, gives wheel recommendations for every major kind of material from agate to wrought iron. Wheel selection for zirconium, ceramics, germanium, titanium, is discussed in the proper chapters.

brazed successfully with

SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY

Millers Falls Router Bits and Dyno-Mite high-speed power bits are revolutionary in concept, design and materials. They both perform with such unmatched efficiency that they have reached the "top-of-the-list" in their field.

Dependable, prolonged service is a "must" for all Millers Falls products and the component parts of both bits are therefore brazed with Silvaloy. The joints are as strong as the high-speed steels they join. Millers Falls uses Silvaloy 45 and Deoxo flux for these operations.

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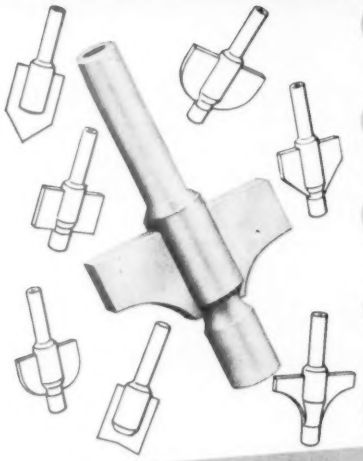

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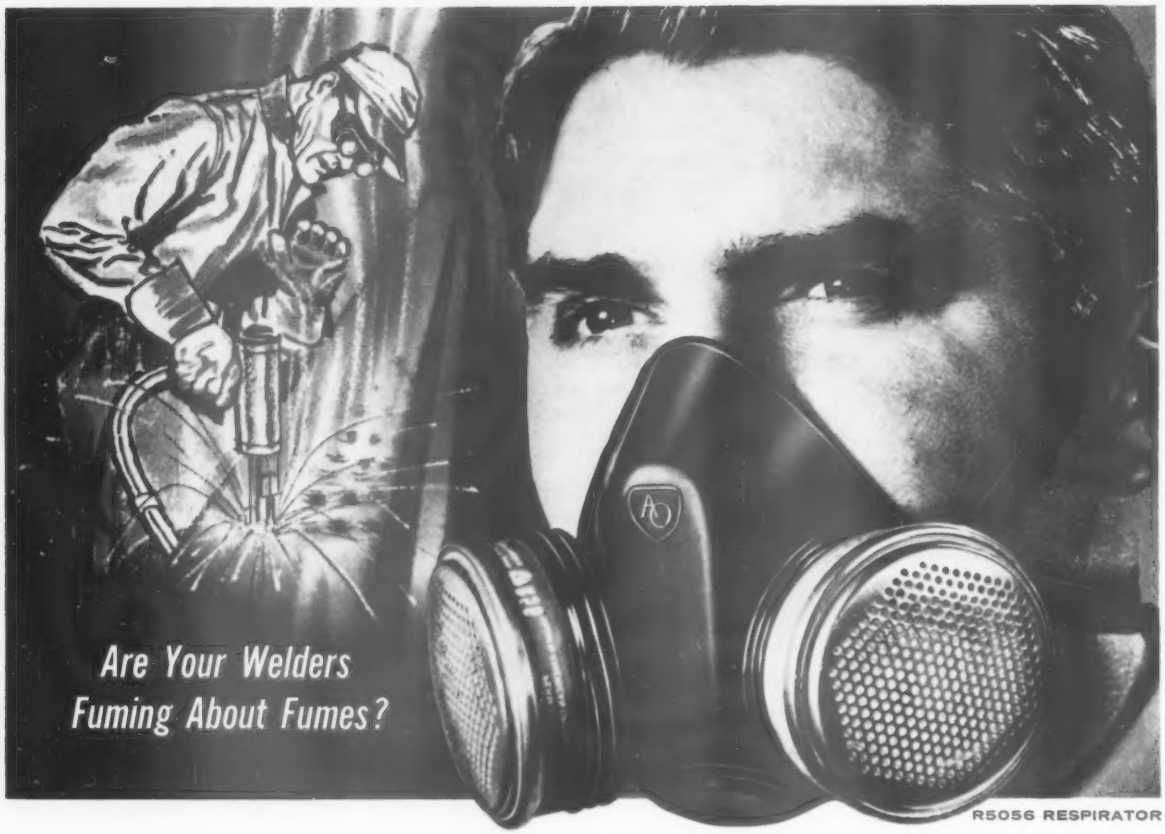

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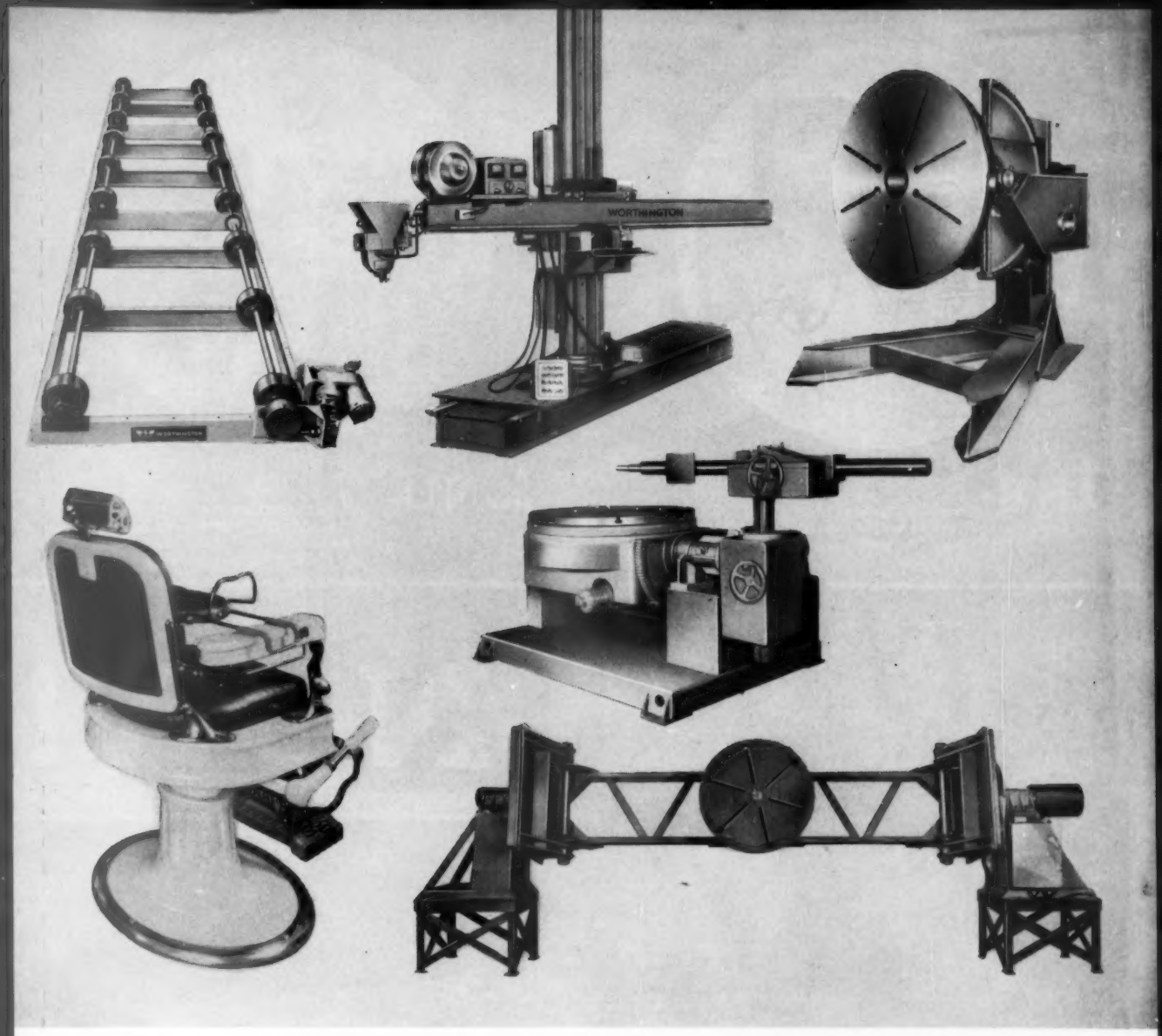

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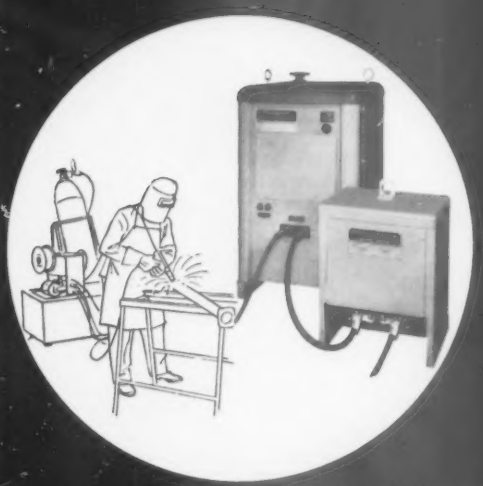

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Economics In Designing And Manufacturing Of Welded Fabrication

PART ONE / in a series of three articles

Manufacturing: Materials

COMPETITION IN MANUFACTURING is real. It's immediate, it's pressing. One must scrutinize every possible means to keep up with our fast moving economy. We design our products so we can make them economically. We also design them to perform well, to meet the needs of the buyers.

MANUFACTURING

Welding gives a truly overall freedom of design. Foundries have also made overtures to this advantage. Welded structures have all the advantages of castings. You can, if you have a welded structure, use castings in it, as well as forgings, extrusions, forming and special steel mill products. In other words, you can take advantage of most of the other arts and technology of metal working. On the other hand, in a foundry your design freedom is limited by capitalization of pattern equipment, pouring problems, and types of materials available. In addition foundries must put up with uneconomical weight-strength material ratios.

A foundry uses an all-in-one design—no loose parts. By using welding foundries can also provide standardization of components. This reduces equipment cost, increases yield with fewer shop operations and aids in cost improvement. However, there are limits to all methods, processes, and equipment. You have to know these limits and plan your manufacturing activity within them.

After graduating from the University of Minnesota, Mr. Mikulak became associated with the Mechanical Design Department and acted as Assistant to the Mechanical Engineer at Electric Machinery Mfg. Company in Minneapolis. In 1938 was placed in charge of the welding operations. In 1945 he became Chief Engineer of Welded Products Division and then Senior Research Engineer at the American Car and Foundry Company. Mr. Mikulak's present position is Assistant to the Vice President of Manufacturing at Worthington Corporation.

What's wrong with foundries?

Castings must have large fillets, curved corners, uniform walls, sloping sides, ribbing, no walls under ⅜". Often assemblies are made in parts and bolted together.

What's wrong with weldments?

Weldments have their own shortcomings. These are (1) high cost of depositing metal, (2) it's not always easy to fit up joints exactly, and (3) it's often difficult to position, handle and move assemblies being fabricated and welded.

Cost Variables: Other points to remember in keeping manufacturing costs down are: quantities, inventory cost, frequency of inventory turnover, burden costs, capitalization, and labor markets.

Lower capitalization expense for productivity levels are in sales dollars. Figure 1 compares the productivity of the foundry with the productivity of the weldery. You can see that the figures show that in 1939 welderies began to buy much more equipment than the foundries.

Figure 1 also shows that over the last fifteen years the dollar value of production by welding has increased, but there has been a steady decline in the foundry. Yet capitalization in the foundry was increased 840% between 1939 and 1947, and 960% between 1939 and 1954. That compares with only 565% and 835%, respectively, in the weldery. These values indicate that the productivity in billing dollars index versus capitalization (between 1939 and 1954) is 35% in favor of the weldery.

Also favorable for the weldery: the total capitalization per unit increase in product output is under that required in the foundry. The welding industry has also enjoyed 3 times the dollar volume in production of tooling and equipment.

Lower indirect burden expenses: Indirect ex-

Industry & WELDING
MAY, 1959

And Methods

by JOHN MIKULAK, *Worthington Corporation*

FIGURE 1: EXPENDITURES AND OUTPUT FOR CAST IRON FOUNDRY AND STEEL WELDERY

	Shipments: Million Dollars				Facilities: Million Dollars			New Equipment Shipments: Mill. Doll.		
	1939	1947	1954	1957	1939	1947	1954	1939	1947	1954
IRON FOUNDRY	279	1178	1419	1230	3.6	54.1	37.5	6.8	34.4	62.5
WELDERY	153	687	1134	1470	1.7	21.9	17.1	20.6	104	169
	ACTIVITY RATIO				ACTIVITY RATIO			ACTIVITY RATIO		
IRON FOUNDRY	1.00	4.2	5.09	4.4	1.0	15.0	10.4	1.0	5.06	9.2
WELDERY	1.00	4.5	7.45	9.6	1.0	12.9	10.05	1.0	5.05	8.6
	PRODUCTIVITY RATIO *									
IRON FOUNDRY	—	.203	.28	—						
WELDERY	—	.25	.40	—						
	GROWTH GAIN FOR WELDERY									
		18.9%	35%							

$$*\text{PRODUCTIVITY RATIO} = \frac{\text{SHIPMENTS RATIO}}{\text{(EQUIPMENT + FACILITY) RATIO}}$$

(Indicates Rate of Sales)
(Increase to Rate of Capitalization)

pense in the iron foundry is more likely to increase at a higher rate per unit output, because the workers are reluctant to accept working conditions as they are. Improvements mean higher capitalization and, eventually, higher rate of foundry burden expense. Since 1950 indirect expense in the foundry on a per hour basis has increased 280% whereas the weldery has had an increase of only 150%. This shows that the welding industry is making positive strides compared to the foundry.

To further elaborate on paragraph two (subheaded "Manufacturing"): The more capitalization you add for automation, the fewer skilled workers you need. However, one key problem the weldery has is improving design techniques to make full use of processes and materials.

MATERIALS

Most men remember when iron and steel along with copper were the workaday metals of the metal working industry. Many new metals are becoming important. They call for careful attention, extensive research. This is all to the good, because it forces the best use of natural resources, drives us to research new materials.

A casting needs thick walls to do its work. That takes a lot of iron. For a weldment you could take the same iron in the form of steel, add some labor and some investment and produce up to 10 times as much finished machine weight. It takes less energy to make a lighter machine and it costs less to run it too.

Pick metals to suit the jobs and temperatures. Often you can use conventional materials with protective coatings replacing exotic materials. This helps keep costs down.

METHODS

There has been a steady increase in dollar

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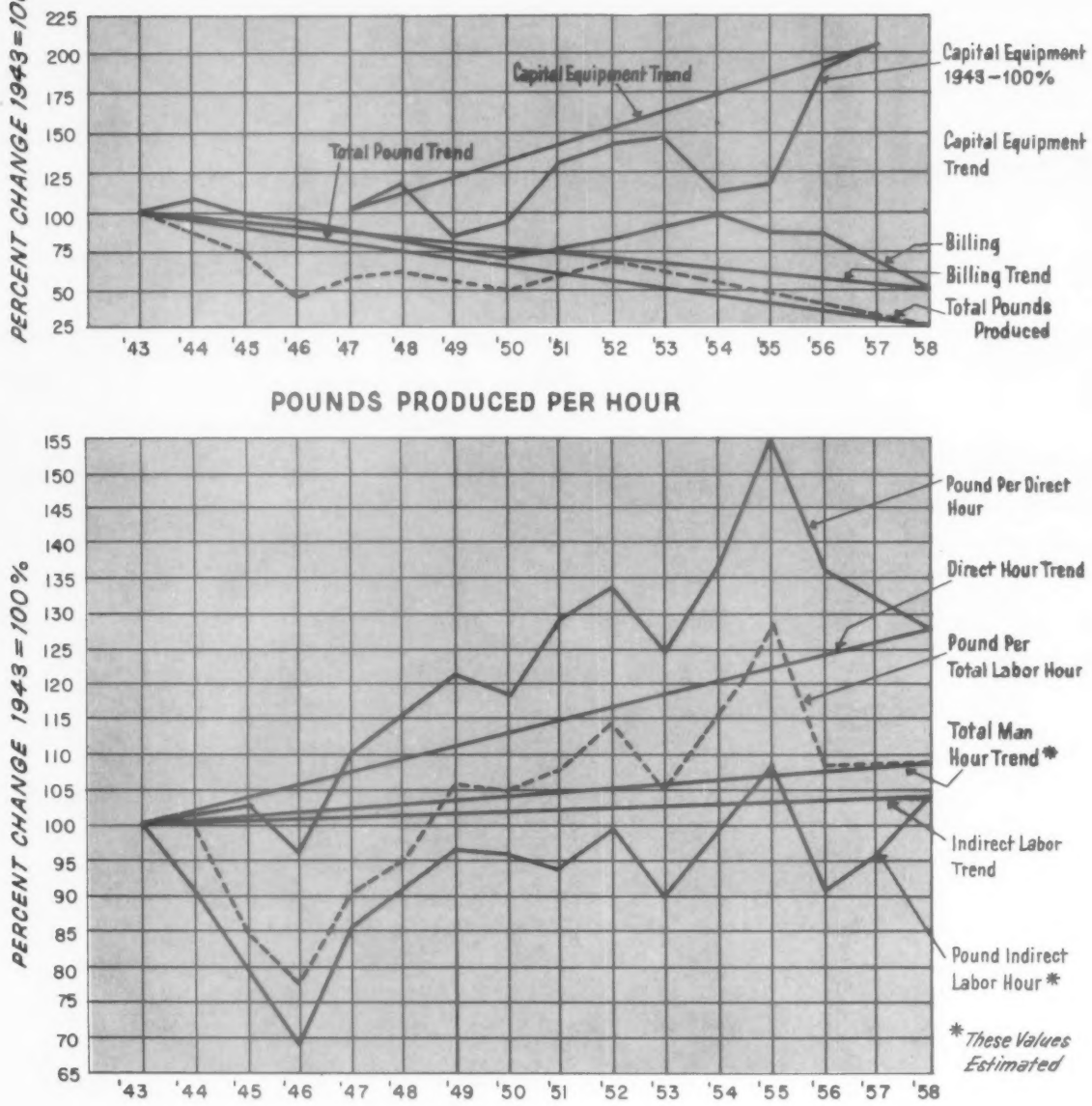
FIGURE 2 PRODUCTION VS CAPITALIZATION INDEX

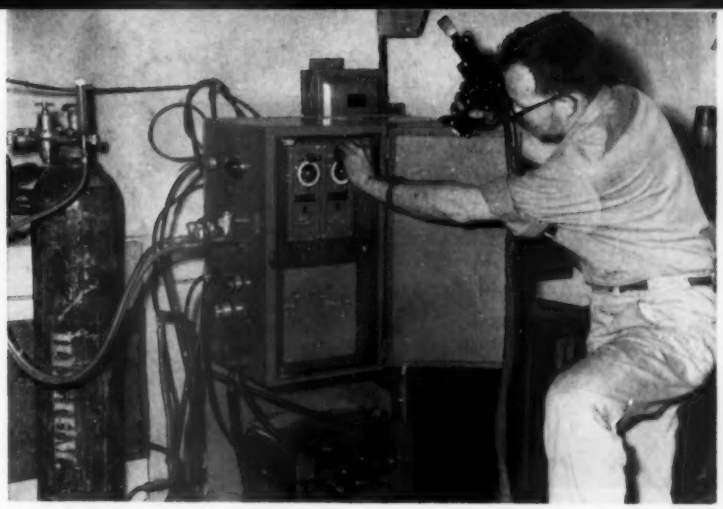


output per employee in the industry but only at an increase in capitalization cost. This can be seen in Figure 2. The figure also indicates the decrease in weight of materials going into manufactured products. Because of the effect of higher speeds, better methods, and the use of alloys, as well as improvement in design, one gets a more accurate anology in functional requirements and in stress interpretation.

For every pound output increase, the actual energy produced by an employee has decreased 47% due to automation in handling material. It can be said, that if we hadn't automated, our output might not have provided for our 24% growth in population for the period between 1947 and 1957.

NEXT MONTH: The author discusses design for welding. He explains process adaptation, economical use of materials and the effect of vibration and noise.

This article is based on a paper presented at the recent Midwest Welding Conference held in Chicago by the Armour Research Foundation of the Illinois Institute of Technology.



this operator can preset two weld times on the control panel, one for light gauge metal, the other for heavier. When he starts . . .

. . . operator stays right on the job, switching from light to heavy timing by using a slide switch located on the gun.

Inert Arc Spot Welding Cuts Costs 60%

IN BRIEF: The strength and beauty of food dispensers is largely due to inert arc spot welding, a flexible, cost cutting process.

FOOD AND BEVERAGE DISPENSERS coming off the production line at Graco Metal Products Company's Lansdale plant near Philadelphia are attractive and strong. Design and styling are partly responsible, but the real clincher is smart, up-to-date production methods.

For instance: The company has switched most of their assembly joining to inert arc spot welding using the new Tec Torch Company Tec-Spot gun. Cabinet subassemblies used to be joined by resistance welding with both portable and stationary equipment. Resistance-made welds were generally good but there were problems. Big subassemblies had to be carted to, and held in the stationary welder by two men. The splice between the front and rear angles, made with a portable spot welder, was necessarily done from the outside of the cabinet. Problem here was twofold: Operator had to support the heavy gun; gun had to be equipped with swivel head upper electrodes to minimize marking. And at times, marking was aggravated by tip condition; if the operator kept on welding when he should have been dressing tips, a bad mar—or even a poor weld—might result.

Inert spot welding takes the strain off the operator. The gun is light, and easily maneuvered into areas resistance welding can't reach. Thus, most welds can be made from the inside of the cabinet, with little or no marking on the outer exposed surfaces. Besides licking the marking problem, the inert arc spot gun cut the operator need to one.

Graco's welding setup includes a Tec Spot control panel with both argon and helium shielding gas leads connected to a solenoid for mix selection; a 260-amp DC motor generator; and a separate high frequency unit. Operation of these units is controlled by the panel which has plug-in provisions on the side.

Two 25-cycle timers on the control panel preset two separate weld times; one for welding lighter gauge metal, the other for heavier.

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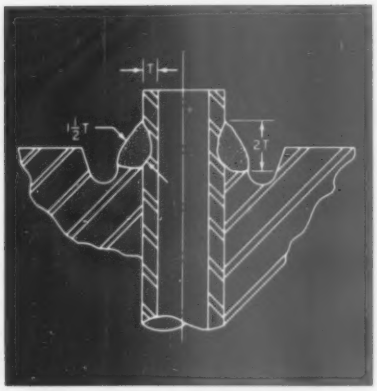
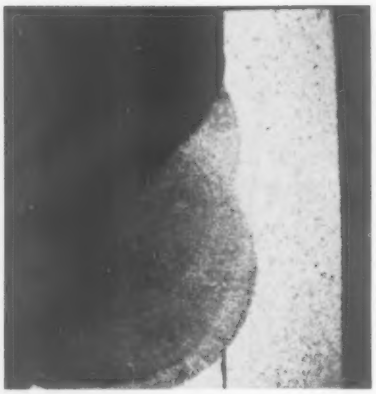


FIGURE 1: Leak path through weld must be at least 1½-times the wall thickness of the tube and at least twice the tube's wall thickness vertically along the tube.



FIGURES 2, 3: Weld penetration varies from one side of the weld to the other. These photomicrographs show variations in a single tube joint when crude, rotating torch was used.

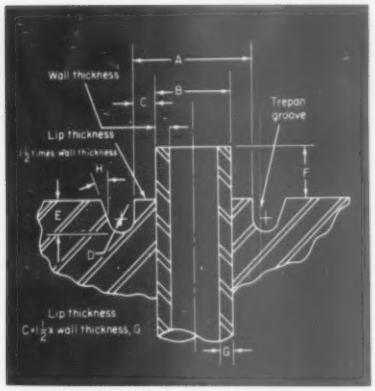


FIGURE 4: Trepan joint has a lip thickness 1½-times the tube wall thickness. This thickness gives weld enough body.

FIGURES 5, 6: Microfissures showed in photomicrographs such as these. Tube joint location of cracks are shown here.

Trepan Joint And Low Ferrite Overlay

IN BRIEF: Here's how one company designed a special leak-free tube joint that holds in the radioactive fluids used in nuclear powered heat exchangers.

A SPECIAL TREPAN joint plays a key role in fabricating nuclear power heat exchangers at the Griscom-Russell Co., Massillon, Ohio.

The atomic energy field uses tubular heat exchangers that have welded tube-to-tube-sheet joints. The joints must be of the highest quality. One of the fluids in the exchanger usually is radioactive. A leak between the sides would let radioactive fluid contaminate other fluid and be carried through the system.

In 1956 we started working on a tube joint for these exchangers. We listed these requirements of the joint.

1. To be made in type 304 stainless steel; type 347 stainless steel, and carbon steel.
2. To be welded.
3. Automatically reproducible to control the quality. We didn't want the work to depend on the health, emotions or ability of the workmen.

We designed the trepan joint. It meets the leak path restrictions. It is the welded joint that has the lowest level of stress in the as-welded condition.

You can see the leak path requirements in Fig. 1. The leak path, through the weld, must be at least 1½ times the wall thickness of the tube and vertically along the tube at least 2 times the wall thickness of the tube. To meet the leak path requirements, the weld nugget had to be of a particular size and shape. The weld must be able to shrink on itself as much as possible to avoid cracking. The room for the welding was restricted. Finally, all the welds had to be near perfect, with little or no visible variation from one to another.

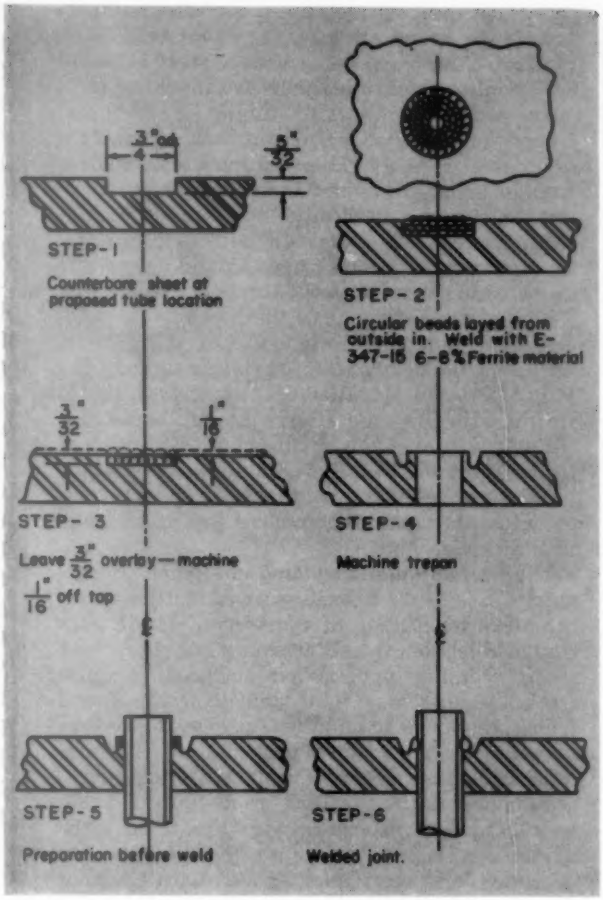


FIGURE 7: Spot overlay of controlled ferrite weld metal at the tube joint completely remelts in welding and holds delta ferrite to a level of approximately 3 to 5 percent.

Stop Microfissuring

The limitations dictated the welding process we could use, because the heat control had to be exact and there was limited space. The tungsten inert gas (TIG) process was clearly the one to use. It lent itself to automatic welding and to joint that needed no filler metal. We could control the heat to a fine degree. Manual operation of the TIG process cannot be worked manually because the space is limited and it wouldn't make such a good weld.

Obviously we needed an automatic process to make reproducible-quality welds. For our first attempt we made a crude rotating torch supported on a movable arm attached to a supporting post. We developed the joint using this setup. We had to position the work vertically under the torch.

The weld penetration varied from one side of the weld to the other as well as from one joint to another. You can see in figures 2 & 3 photo-

by **E. W. ROWLANDS**

The Griscom-Russell Company

Massillon, Ohio

micrographs showing the variation of penetration of the two sides of a single tube joint. The welding gun had to have its electrode set for each joint. Yet it worked good enough that we developed the joint.

The trepan joint (Fig. 4) had a lip thickness (C) 1½ times the tube wall thickness (G). This lip thickness gave the weld enough body. The tube extension (F) was set so that there would be no danger of the top of the tube becoming overheated and melting off during the welding. The depth of the trepan (E) so the weld would have a nugget twice the wall thickness completely on the trepan lip. This allowed the weld to shrink without stressing either the base material or the tube sheet at the root of the weld. The width and shape (or section) of the trepans were picked so there would be room enough for the angled electrode to strike an arc on the lip and not on the O. D. of the trepan. We shaped the trepan so that it had no sharp corners that might become stress points.

Another variable was added when type 347 stainless steel base material was specified. It is a stabilized austenitic stainless steel, has good high temperature corrosion resistance but is subject to intergranular fissuring. This fissuring is thought to be caused by stresses which are set up in the weld and surrounding material when the weld shrinks. Some authorities feel that it is caused when the low melting compounds segregate between the dendrites and inter-granularly during the cooling of the metal, forming slippage planes. The cracking is less likely to occur if the metal contains some delta ferrite, because the ferrite provides an increased grain boundary area on which the low melting point compounds may segregate without reaching dangerous concentrations. Photomicrographs showed examples of these microfissures. Figures 5 and 6 show the tube joint location of the cracks. The samples had no positive amount of ferrite, as calculated from the chemical report on the material with the use of the Schaeffler Constitutional Diagram. This low ferrite count alone could have caused the microcracking. But the overlapping of the start and stop of the welding also created a reheating condition that was very conducive to cracking.

Both conditions were corrected in the laboratory. Then we got crackfree welds. We corrected the overlapping by timing the slope control to slope the current off when the circle was completed. We used 347 stainless steel containing at least 3% ferrite. That corrected the chemical composition.

But under production conditions the ferrite

TREPAN JOINT
continued

content could not be reliably controlled. This raised the problem of how to change the ferrite content of whatever 347 stainless steel forging was received on the job. Our solution was to make a spot overlay of controlled ferrite weld metal at the tube joint. Figure 7 makes this clear. Machining the joint leaves only a small ring of the overlayed material on the lip of the trepan. This overlay completely remelts in welding, holds the delta ferrite to a level of approximately 3 to 5%. We are careful to keep the ferrite content below 8%. Above 8% there is danger of sigma-phase formation. This formation is an intermetallic compound of iron and chromium that is extremely hard and brittle, has very poor corrosion resistance.

The overlay preparation was used to weld 347 stainless steel tubes with a 0.072-in. wall thickness to tube sheets. Trepan joint design was the same as for the 304 stainless steel tubes. But the new material was known to contain very little ferrite. Microfissures extending from the tube I. D. into the weld fusion zone were clearly noticed in photomicrographs of a horizontal section through a sample tube containing no delta ferrite.

Overlay welds were made with certified rod containing 6 to 8% delta ferrite by chemical composition. Photomicrographs at 1500X magnification were taken of the welds to determine ferrite content by the 10-line count method. The 10-line count method computes percentage of ferrite per uint area. This percentage is normally considered to be on the high side because there is no assurance that all the dark material seen in the photomicrographs is delta ferrite. A chemical analysis is used as a rough guide for the rule of thumb that accepts 3 to 8% delta ferrite as the best welding composition. Overlay trepan preparation was used to weld ⅜-in. O. D., .072-in. wall, 347 stainless steel tubes to 347 stainless steel tube sheets as shown in Fig. 8.

For welding thin wall tubing, an original trepan joint design proved unsatisfactory for a number of reasons. The welding arc tended to wander over the beveled lip of the trepan varying the size and position of the joint. The machining was costly and difficult to duplicate. The heavier root of the trepan lip did not permit the weld to shrink with the tubing. This created a highly stressed point at the root of the weld.

A new joint was designed after the pattern set up for the heavy wall 304 stainless steel tube joint (Fig. 4). It allowed the trepan lip to shrink with the tube after welding. Some machining was avoided by the change. The new trepan joint was also easier to duplicate because the design called for holding only 1 dimension to a close tolerance as compared to 4 dimensions in the earlier joint.

The new automatic welding equipment developed by Griscom-Russell, as well as the close-tolerance machining of the trepan, are in part responsible for the consistency of the weld shape. Similar penetration and configuration from one side of a tube weld to another and from one joint to another was evidenced in photomicrographs of opposite side of three different tube joints. From the photomicrographs we noticed at the roots of the same welds there were cracks with this weld technique.

These welds were all produced with the new automatic TIG welding gun. The gun is used with an electronically controlled welder (Fig. 9). During the welding cycle the welding operator need not be near the gun. This gun can make trepan welds from the vertical as

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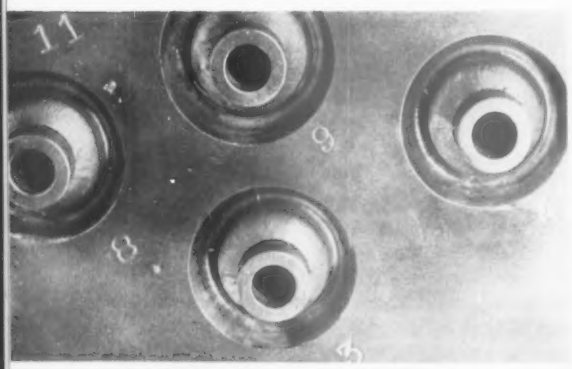


FIGURE 8: Overlay trepan preparation was used to weld ⅜-inch, .072-inch wall Type 347 stainless tubes to Type 347 stainless tube sheets.

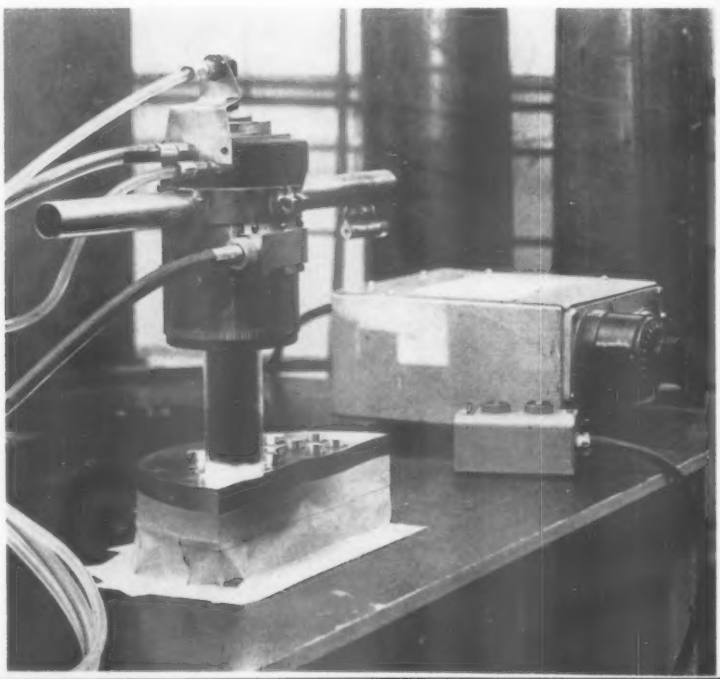


FIGURE 9: Automatic welding gun is powered by an electronically controlled welder.

PROCESS ANALYSIS CHECK LIST

Item of Consideration	Designer	Engineer	Operator
1. Type of material	xx	x	x
2. Type of tungsten electrode required		x	x
3. Thickness of material	x	x	
4. Joint design and required alignment	x	xx	x
5. Necessity for and type of back up	x	x	
6. Design of clamping fixture		x	
7. Welding speed desired		x	
8. Economics of the inert gas process	x	xx	
9. Degree of mechanization for welding		x	
10. Position of welding		x	xx
11. Amount of welding current required		x	x
12. Diameter of tungsten electrode		x	x
13. Type and purity of gas—or mixture		xx	x
14. Required gas flow		x	x
15. Atmospheric condition		x	x
16. Correct welding technique and sequence		xx	xx

TROUBLE SHOOTING GUIDE

PROBLEM	CAUSE	REMEDY
ARC INSTABILITY	1. Dirty, greasy, etc. base mat'l.	1. Use appropriate chemical cleaners, wire brush, or abrasives, etc.
	2. Joint is too narrow	2. Widen joint groove; bring electrode closer to work, decrease voltage.
	3. Contaminated electrode	3. Break or cut off that portion of electrode.
	4. Electrode dia. too large	4. Use smaller electrode — use smallest dia. possible that will properly handle needed current.
	5. Arc too long	5. Shorten by bringing holder closer to work.
RAPID ELECTRODE CONSUMPTION	1. Improper inert shielding (oxidation of electrode taking place)	1. Clean nozzle, bring nozzle closer to work, increase gas flow.
	2. Operating on rev. polarity	2. Change to St. polarity or use larger electrode.
	3. Electrode is of improper size for current required	3. Use larger electrode, (see current chart for electrodes).
	4. Excessive heating in holder	4. Change collet; use ground finish electrodes; check for improper collet contact.
	5. Electrode contamination	5. Remove contaminated section—erratic results continue as long as contaminants are present.
	6. Oxidation of electrode during cooling	6. Continue gas flow after stoppage of arc for at least 10-15 seconds. Rule—(1 second for each 10 amperes).
TUNGSTEN INCLUSIONS IN WORK PIECE	1. Touch starting with electrode	1. Use hi-frequency starting device; use a striker plate of copper or carbon.
	2. Electrode melting and alloying with base plate	2. Use less current or larger elect.; use thoriated or zirconated tungsten (these run cooler).
	3. Fragmentation of electrode by thermal shock	3. Make certain elect. ends do not possess slivers, cracks, etc. especially when using high current values. Use embrittled tungsten to facilitate easy and clean breakage.
POROSITY (GENERAL)	1. Gas impurities present (hydrogen, nitrogen, air water vapor)	1. Use welding grade (99.995) inert gases, purge all lines of air, before striking arc; remove condensed moisture from lines.
	2. Possible use of old acetylene hoses	2. Never use anything but first hand hoses. Acetylene impregnates hose.
	3. Interchanged gas and water hoses	3. Never interchange gas and water hoses. (Use different color hoses.)
	4. Oil films on base material	4. Clean with a chemical cleaner not prone to dissociate in arc; DO NOT WELD WHILE WET.

use these check lists for . . .

Tungsten Inert Arc Welding

third of a series
by **FRANK KUNCZ***

IN BRIEF: Good planning can prevent welding problems; if it doesn't, a trouble-shooting check list can clear them up in a hurry.

BEFORE AN ARC IS STRUCK, it is wise for the designer, the engineer and the operator — either individually or collectively — to make a process analysis check list (left). The entire check list is important to each of these individuals, but the responsibility for certain facets rests more heavily with one individual as indicated by the accompanying chart. (It is conceivable that one individual may necessarily be all three of these in many job shops.)

Welding techniques and sequence are the joint responsibility of the engineer and the operator. Technique includes torch inclination; extension of electrode; arc length; interpass temperature, preheat or postheat; proper cleaning of tack welds; condition of work piece; weld contour desired; degree of contamination of work piece by electrode; contamination of electrode by work; and degree of allowable porosity.

Welding sequence covers the order in which weld beads are deposited. The sequence is followed in to equalize stresses and minimize distortion or cracking.

But, unexpected and unforeseen trouble often arises in the best planned situations. Tungsten arc welding is no exception; it has its own gremlins. The accompanying chart (left) give some hints on how to solve your particular problems. • •

**Formerly with the Lamp Wire & Phosphors Department, General Electric Company, Cleveland, Ohio.*

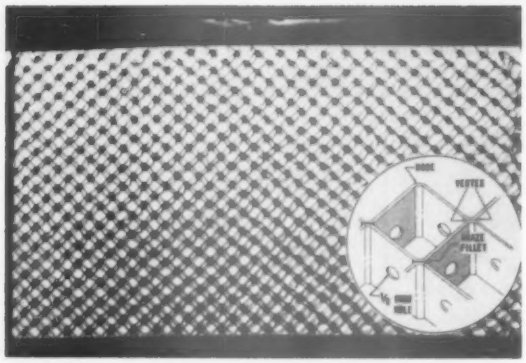


FIGURE 1: X-ray of hollow structural panel that transmits hot fluids that anti-ice the inlet.

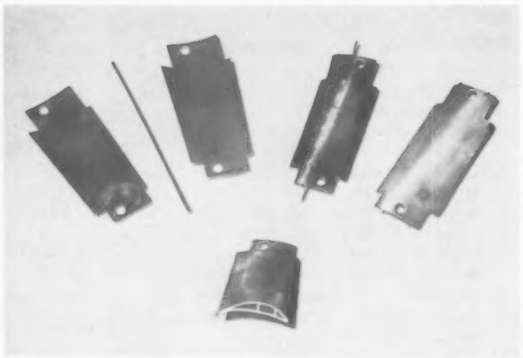
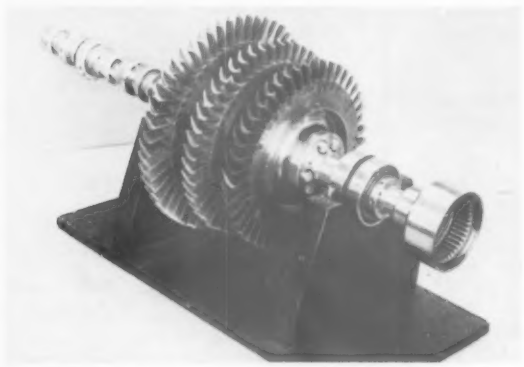


FIGURE 2: Sheet metal parts form light weight, stiff blades when brazed together.



FIGURES 4, 5: Experimental three-stage watercooled turbine rotor (left) has 149 brazed blades. Brazing these blades joins and seals tip caps, side plugs and coolant tubes. Sectioned blade is shown (right).

High Temperature Brazing

IN BRIEF: High temperature brazing is used in turbojet engines to make joints that will stand up under temperatures ranging from −80°F to 3500°F.

HIGH TEMPERATURE BRAZING of gas turbine engine components is not easy.

That's what Solar Aircraft Co., San Diego, California found out in their research and development of high temperature brazed components.

TURBOJET ENGINES
GAS TEMPERATURE ZONES

INLET	COMPR-ESSOR	COMBU-STOR	TURBINE	AFTERBURNER & TAIL PIPE
-80	600°	1600°	1500°	3000°
+300°	900° (EXIT)	1800°	1700°	3500°

WHY DID WE GO TO SOLAR?

Because their research engineers have pioneered and developed high temperature brazing techniques.

It's at Solar that you find the advanced methods for joining a variety of metals for their gas turbine engines.

A turbojet engine has five gas temperature zones. They are, from front to rear, inlet, compressor, combustor, turbine, afterburner and tailpipe.

The choice of proper metals is very important at Solar. This selection means success or failure. An engine must stand extreme heats of table. The temperatures run from −80°F at the nose to 3,500°F at the tail.

We'll describe just a few of the many parts Solar has successfully high temperature brazed for their turbojet engine.

COMPRESSOR:

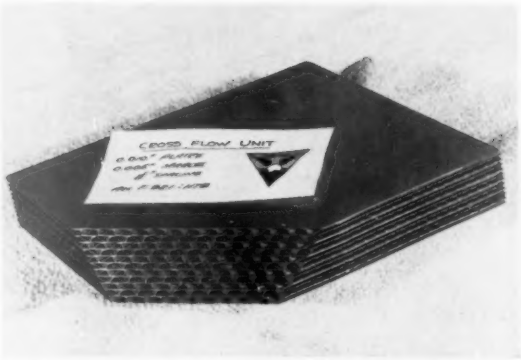


FIGURE 3: Brazed foil-thin corrugations in crossflow heat exchanger transfer heat with high efficiency.

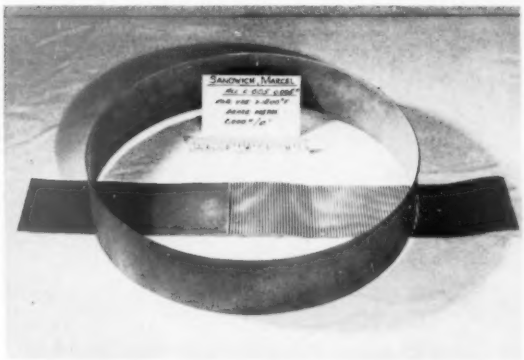


FIGURE 6: Brazed marcel sandwich is used to make a material that can contain heat from the afterburner.

What is high temperature brazing?

. . . it is a joining process in which the molten filler metal used has a melting point in excess of 1600°F, but below that of the base metal; diffusion between the filler metal and base metal must take place.

What does high temperature brazing do?

- *Lets you make complex, multi-component assemblies*
- *Gives you precision production tolerances*
- *Lets you join extensive areas or lengths*
- *Leaves natural braze filleting; insures good stress distribution and fatigue resistance*
- *Does not destroy protective metal coating or cladding*
- *Joins cast materials to wrought materials*
- *Joins widely different metal thicknesses*
- *Joins dissimilar metals*

Of Turbojet Components

Anti-icing: Some inlets at the nose demand skin heating to prevent ice from forming. Figure 1 shows a hollow structural panel that transmits hot fluids that anti-ice the inlet stage. This x-ray photograph shows a perforated honeycomb core brazed to cover or facing sheets. The *honeycomb core:* AISI 321 stainless steel, 0.002″, ¼″ square cell, ½″ thick with ⅛″ perforations. *Facing:* 0.020″ type 321. See exploded view (inset) showing a high degree of braze flow with excellent bonding of edge channels and core ends.

Compressor stator blade: Figure 2 shows blade components brazed into accurate, hollow blades. This is an interesting use of sheet metal to efficiently produce light, stiff blades.

Solar used Timken 17-22A, a high strength, low alloy steel. For brazing they used a nickel base alloy with a flow point of 1,850°F. They were able to braze and Austenitize heat-treat simultaneously.

After furnace brazing and tempering, they buff the part with a light abrasive.

CUMBUSTOR:

Heat exchanger: Figure 3 shows a crossflow heat exchanger. Solar found that the braze bonded foil-thin corrugations transferred heat with very high efficiency.

The marcel (corrugated) foil is 0.005″ Type 321 stainless steel with ⅛″ spacing. The separators are 0.010″ type 321 stainless. At Solar it was revealed that the measurement of high tempertaure braze fillet length gave a surprising figure of 3.84 miles per cubic foot of core matrix. This term is known as braze "mileage factor."

TURBINE:

Turbine blading: Figure 4 shows an experimental 3-stage, watercooled turbine rotor with 149 brazed blades. Figure 5 shows one of these blades sectioned. Solar found that brazing served 3-fold purpose. It joined and sealed the tip caps, side plugs, and coolant tubes.

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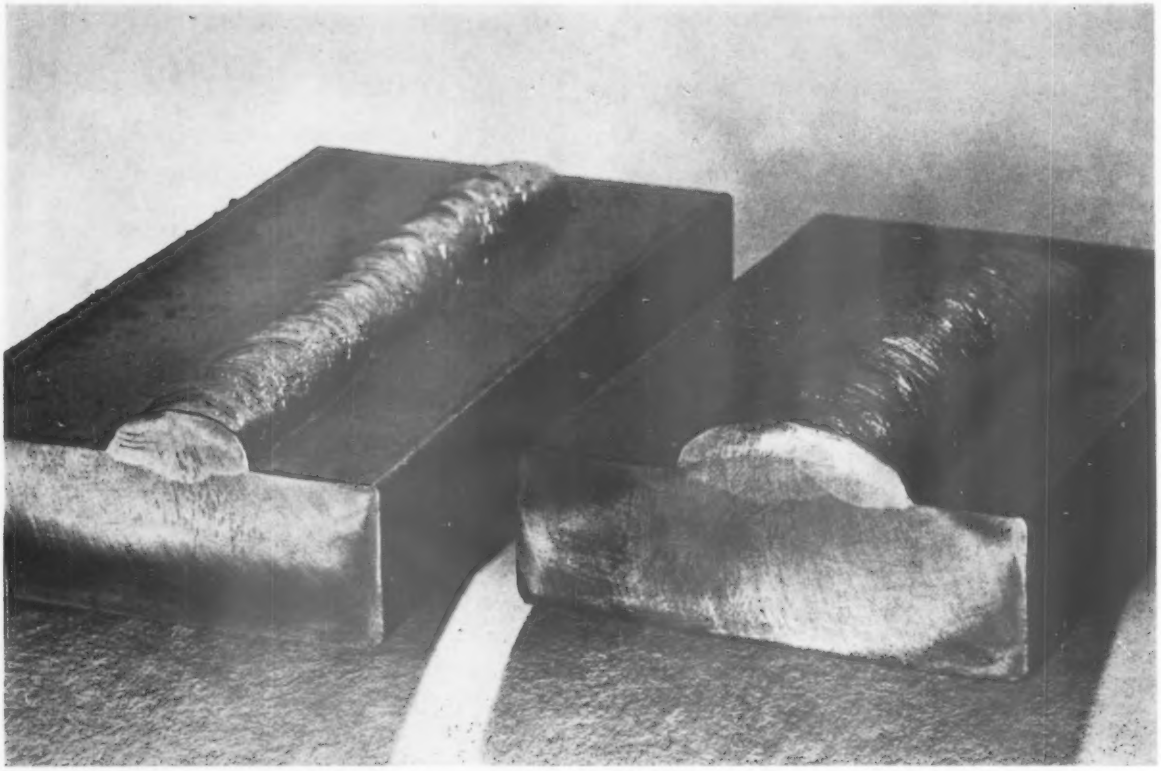

Two typical weld samples using Stoody Iron Powder Build-Up. At left is a stringer bead showing high build-up with a single pass. At right is a two pass weaving bead. Etched and polished ends show depth of penetration. Compare these results with your present build-up material.

Try New Stoody Iron Powder Build-Up

...then compare the build-up height!

You can rebuild worn equipment faster and get sounder, tougher deposits with STOODY IRON POWDER BUILD-UP!

This new build-up electrode is a "natural" for use on parts made of carbon and low alloy steels. Deposits are tough, rigid, resistant to mushrooming and cold flow.

Most important, *hardness of deposits is not dependent on carbon, but is the result of STOODY BUILD-UP'S balanced alloy content!* This means greater uniformity and overall dependability of deposits—regardless of variations in base metal analysis.

Try IRON POWDER BUILD-UP today! Available from your Stoody Dealer (Check the Yellow Pages of your phone book) or write direct.

HOW STOODY IRON POWDER BUILD-UP SOLVES TODAY'S BUILD-UP NEEDS:

1. Makes high deposits in a single pass.
2. Lays down more pounds per hour at a lower cost per pound.
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4. Provides strong support for overlays.
5. Won't spall, work-harden or crack.
6. Deposits will not exceed 45 Rc in hardness even when quenched.
7. Deposits are machinable.
8. Excellent weldability with minimum spatter and smoke.

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750 feet of weld goes into the . . .

Fabrication of 87-Foot Long Girders

IN BRIEF: 87-foot long welded bridge girders take precambered webs, special jigs, and both manual and semi-automatic welding.

OHIO'S NORTH-SOUTH TURNPIKE is going to have bridges with welded girders. The Allied Metals Co. (of Niles, near Youngstown, Ohio) is making them for three of the bridges. Each has four girders. Allied's skill in making these difficult structures keeps its shop humming.

These facts will give you some idea of the size of the job: The longest girder is 87 feet long. Another, a 79-footer, weighs 15,805 lb and has 648 feet of weld. Girder steel is welding quality ASTM type A 373. Most of the welding is submerged arc.

You have to handle an ultralong, ultraflexible job of this sort in special ways to get accuracy and strength. Allied worked its procedures out carefully. Here is how they go:

The finished girder is an I-section cambered in its length. To make a web, they buttweld two long plates end to end. These plates are 62¼" wide, ⅜" thick. They bevel the butting edges to make a 60° included angle single-V joint with a $\frac{1}{16}$" land. They allow a ⅛" gap between the plates to allow for transverse weld shrinkage. This allowance is important in order to have the web plate end up the right length. Using coated electrodes, they fill the groove in three passes, then seal-weld the root side. Afterwards they grind both welds flush.

The camber is 1¼" for the whole girder length. The plates comprising the web are precambered by flame cutting before they are finally buttwelded into the finished web.

Top and bottom flanges are made of three plates welded together. Two of them are 16-inches wide, $\frac{11}{16}$ inches thick. The third is 22

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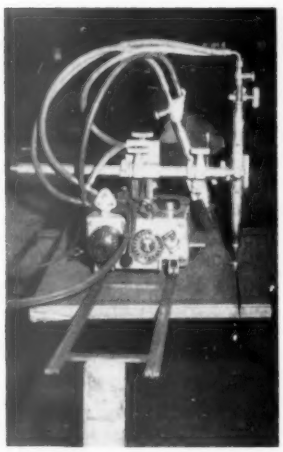
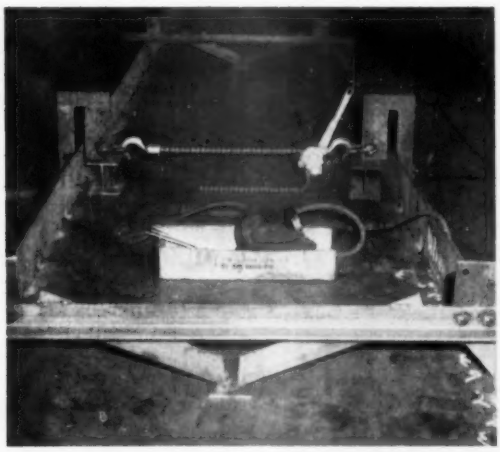
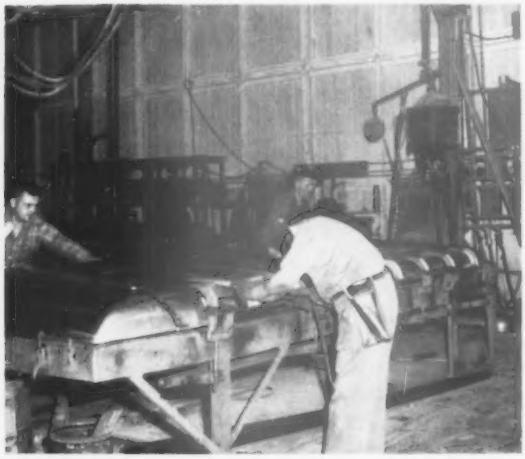




FABRICATION STEPS include flamecutting of flange plates with portable equipment (left); fitting, clamping and tacking of flanges to precambered webs (middle); and semi-automatic submerged arc welding of main joints.

DASH-AND-DECK ASSEMBLY: Fixture is mounted on head and tail stock for fast convenient positioning and welding.

CAB ASSEMBLY: A three-man crew fits-up, arc and spot welds cab subassemblies in a single fixture.



ROOF ASSEMBLY: In one operation crew welds rafters to frame and spot and arc welds shell to roof.

SIDE DOOR ASSEMBLY: Operator makes 54 spots with this air-operated press-type spot welder.

Faster Welding With Special Fixtures

IN BRIEF: Subassemblies for mail truck bodies are made faster and easier in special welding fixtures

FOR THE LAST 25 YEARS the hundred-year-old Gerstenslager Company of Wooster, Ohio has been making mail truck bodies.

It uses mild steel exclusively in fabricating the mail truck body. The roof assembly is of channels, angles, and 18-gage sheet. The deck-and-floor assembly is of 14-gage hot-rolled tread plate. A little more than half of the assemblies are of sheet and angle iron of the same gage.

The E 6013 electrode is pretty much the shop standard. Electrode diameters range from ⅛″ to 5/32″. The shop uses, for tacking and welding, currents of 90 to 120 amps and D.C. straight polarity.

FINAL PRODUCT: Mail truck rolls off the production line. Vans and bookmobiles are made in the same way.

Special Fixturing:

Gerstenslager uses subassemblies whenever possible. They greatly speed production. Some of the subassemblies are dash-and-deck, floor, cab, and side. The fixtures are designed in a way to make it easy to put parts in and to take the assemblies out.

Production really buzzes at Gerstenslager's. The reason, the men are on measured day work. Seventy-five percent of their welding is done by team. Most of them share their work as a

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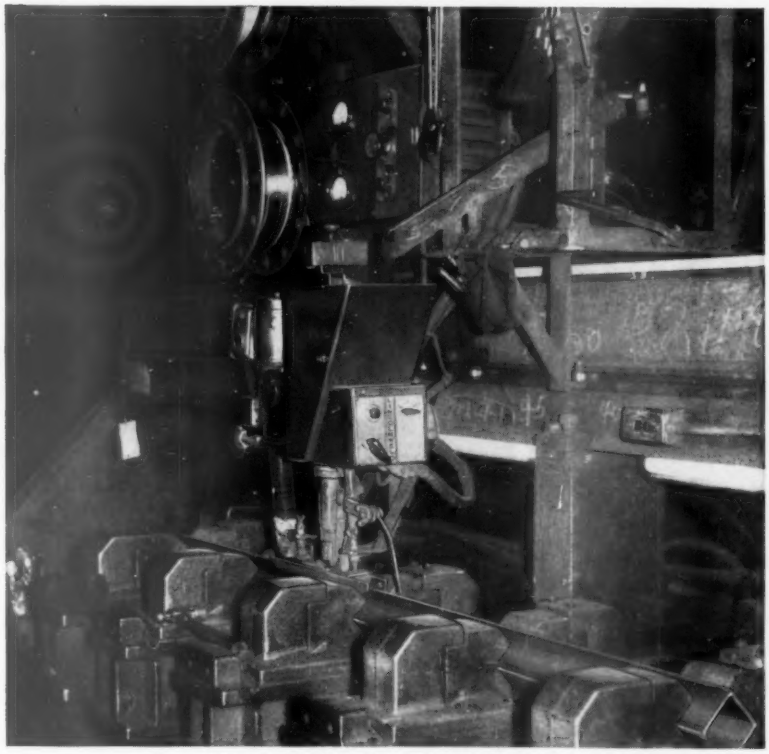
Lincoln

WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS



Four foot, ¼" box beam is positioned, welded and cleaned in 2½ minutes. Lincolnweld with Twinarc welds at 90" per minute.

TWINARC SIMPLIFIES WELDING... UPS FARM MACHINE PRODUCTION

The Krause Corporation has increased production on box beams 33% with their Lincolnweld Automatic welder by adding a Twinarc attachment. This company in Hutchinson, Kansas, makes one-way plows, wheel-mounted disc harrows and chisels, self-propelled forage harvesters and other farm equipment.

The Twinarc attachment feeds two welding wires through a single submerged arc welding head, doubling the speed of welding with a single wire.

Krause fabricates the box beams from ¼" angles. The angles are put in a jig, clamped in position with hydraulic positioners. The Twinarc makes one pass on each of the two edge seams at 90 inches-per-minute.

Mr. Wilbur Thomas, Krause's Welding Foreman says, "The Twinarc not only welds faster, but higher currents make it possible to weld the angles without cleaning off light rust and oil which used to cause some imperfections when a single wire was used."

This application has proved so successful at The Krause Corporation that they are now installing their second Lincolnweld Automatic welder with a Twinarc attachment.

For help with welding procedures, or cost reduction ideas, call your Lincoln welding engineer today.

Wilbur Thomas, Welding Foreman, "Savings justified the purchase of a second machine."

Catalog Available

Complete information on Lincolnweld Automatic Submerged Arc welding equipment and accessories is contained in Bulletin 5200.1. A copy may be obtained by writing, on your letterhead to Lincoln.

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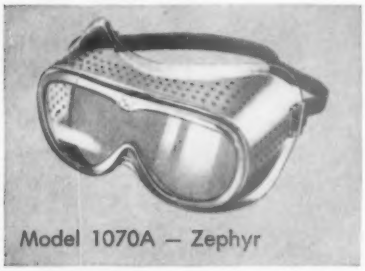

Model 1070A — Zephyr

WELSH ZEPHYR — New, increased working visibility . . . greater top ventilation! The first major improvement since the origin of the soft-side. Choice of five ventilation styles.

Model 5070 — Cyclops

WELSH CYCLOPS — A one piece aperture welding goggle . . . soft side frame provides the ultimate in comfort, fit and visibility. Simplified lens holder permits easier changing of filter and cover plates.

Model 5050 — Soft-I

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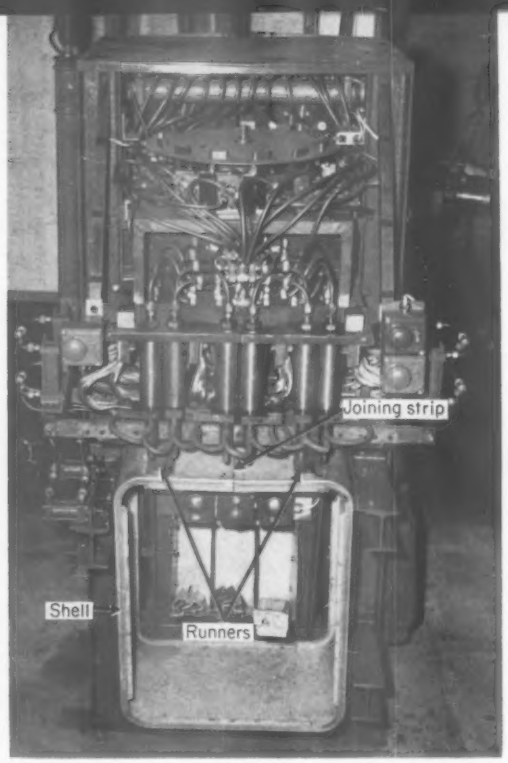

AN OVERSEAS REPORT from England explains how a refrigerator manufacturer's . . .

Multi-Spot Welder Does Three Jobs At One Time

IN BRIEF: A 24-gun spot welder lets one operator do the work of two. It joins a refrigerator shell and welds two runners to it in a single operation.

INGENIOUS ENGINEERS helped Lec Refrigeration Limited, Bognor Regis, Sussex, England, keep production high and costs low when the company introduced the *Coronet*, a low-priced compressor type refrigerator.

The need was for a multi-spot welder to join the refrigerator shell and weld two runners to its base in one operation. In the past a joining strip was inserted and the shell welded together. Then the two channeled runners would have been welded to the base, one at a time. None of the English resistance welder manufacturers could make a suitable machine cheap enough or soon enough.

The solution came from Lec's own engineers. They designed and built their own 24-spot resistance welder. Direct firing, it fires electrodes in pairs, completing a welding cycle in only eight seconds.

Here's how the new machine (called "No-Bonus Ernie") works. An operator puts a 2-inch by 20-gauge joining strip into a slot in the machine. Then he positions the refrigerator shell on a table and presses two buttons underneath. These start pneumatic cylinders which, working in unison, close the shell, square it, and clamp it to the table, ready for welding.

All that remains for the operator to do is insert the runners into guides and press start buttons. Both must be pressed to start the automatic welding cycle.

A rotary mechanical timer near the top of the machine operates welding cylinders two at a time. This timer also initiates the ignitron contactors which pass current to the two 30-KVA welding transformers. An electronic timer determines weld time.

The welder uses 400-volt, 3-phase AC current. The trans-

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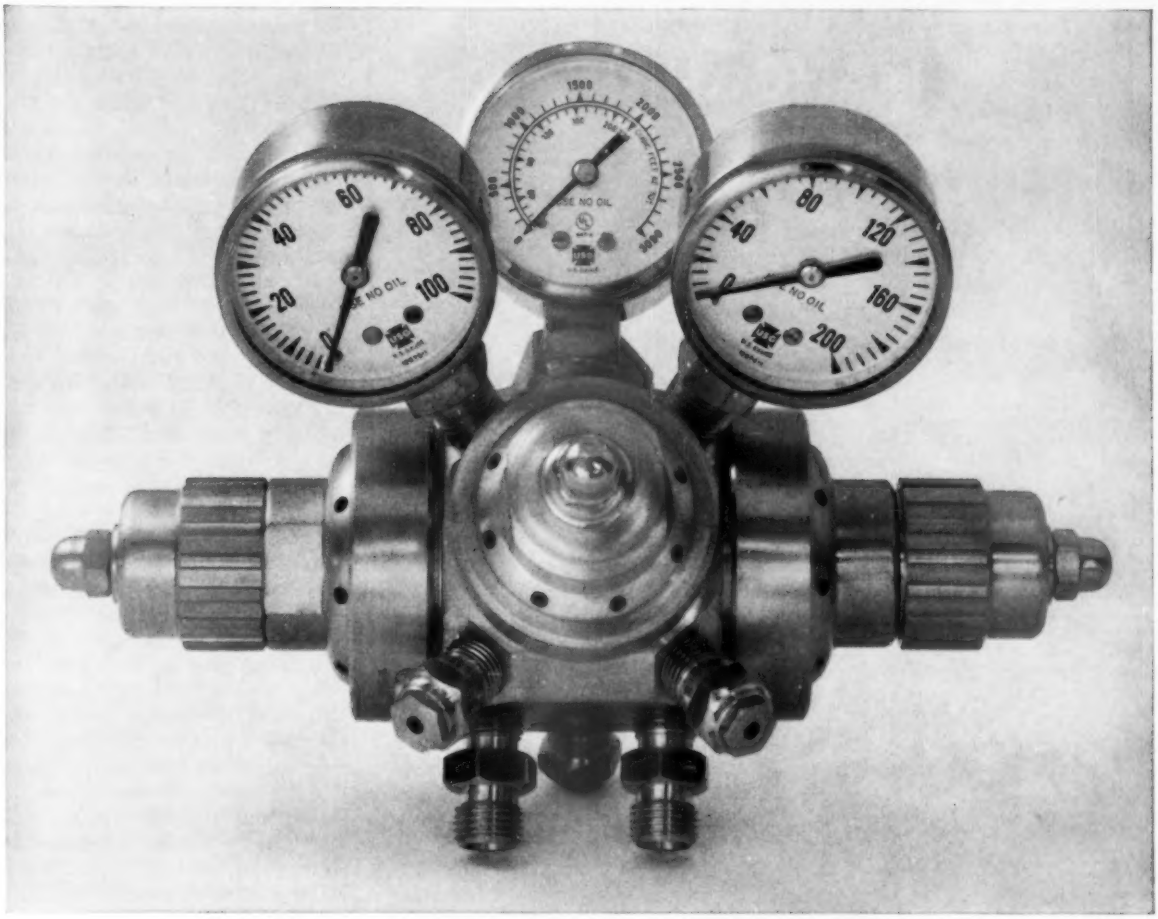
For Three Hose Cutting Torches . . . SEPARATE REGULATION



THE NEW TRIPLEX OXYGEN REGULATOR for three-hose flame cutting torches.

Here is a brand new regulator combining into a single unitary body one high pressure stage and two individually adjustable low pressure stages; one low pressure stage to control the preheating flame oxygen and the other one for the high pressure stream of cutting oxygen. The regulator is provided with two outlets, three self-reseating relief valves to protect each individual stage and one inlet. Three $2\frac{1}{2}$" diameter gauges indicate respectively, the low pressure oxygen stream, the high pressure oxygen stream and, the center gauge, the cylinder or cylinder bank pressure. The regulator body and caps are machined of dense brass bar stock, and all internal working parts are interchangeable with all other standard regulators of comparable diameters made by our company. This new Model 5-121, National Triplex Safety Regulator will be of interest to all companies operating three-hose machine cutting torches — write for catalog FORM #16.

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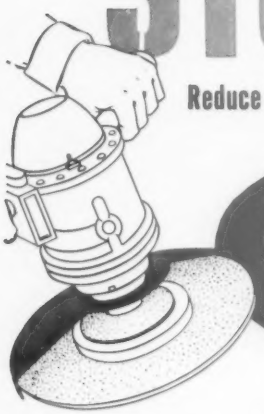

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LONG GIRDERS

continued from page 39

inches wide, 1¼ inches thick. It is tapered into the narrow width by flamecutting, and into the $\frac{1}{16}$-inch thick flange by machining. The joints between flange sections are double-V's (60° included angle and $\frac{1}{16}$-inch land). These, too, are opened up ⅛-inch in fitting to allow for weld shrinkage.

Fitup: The web plate is blocked up on horses spaced about 8-feet apart. Company-made jigs exactly center and square top and bottom flange plates with the web. The fitters use four jigs (two for each web plate). They are made of angle iron and bolted around the girder.

Both top and bottom flanges are pulled snug to the web with a clamp made of a ratchet chain hoist and flame-cut hooks. When snug, 1-inch tacks are made every foot. Then the clamp is moved on, the process repeated until the whole girder is tacked. At each flange joint, weld-through cutouts (1-inch radius) are made in the web plate.

Rolling the girder over for flange and web welding is ticklish, and would be nearly impossible without jigs. They add strength while two bridge cranes lift the assembly and stand the girder on a flange. Additional strength is needed because the assembly is so long, flexible and weak that any twisting (such as the cranes might introduce by lifting at different rates) could easily crack off or deform parts.

When the girder has been set on beams, the fitters bolt angle iron braces to the locating jigs, top and bottom, to prevent tipping or even collapse. Then they weld the top flange V's on the topside, bottom flange V's on the inside. These joints are welded with coated electrodes in about three passes, then ground flush.

Submerged arc fillet welding of web to flange follows. Working on either side of the girder, operators deposit $\frac{5}{16}$-inch fillets simultaneously the full length of the girder. They use $\frac{3}{32}$-inch welding wire. Allied gets all the deep penetration, speed and weld quality they need with this

process.

The same procedure is repeated on the other side when the girder is turned.

The 24 stiffener plates are what really tie the whole assembly into a rigid enough structure to hold up a road. They are welded to each side of the girder. These plates are 7-inches wide, $\frac{5}{8}$-inches thick and are welded all around, both sides with $\frac{3}{16}$-inch fillets. This accounts for 260 feet of total girder welding. • •

MULTI-SPOT WELDER

continued from page 42

formers are rated at 30 KVA, but their secondaries are short, so the output probably is more. Standard electrodes are used with ¼-inch diameter tips; pressure is about 300 psi. Actual weld time is about 12 cycles.

The pneumatic clamping cylinders release automatically after the last weld is made. Then the operator removes the completed shell.

The entire operation takes only 25 seconds. One operator does the work of two in less time. Production has gone as high as 2,000 units per week.

The company now is designing two new, similar welders. The first will weld the backs on the shells. The second will be used when a new 6-cubic-foot refrigerator goes into production. The machine will weld the back on and, at the same time, a number of brackets to support the refrigerator unit and condenser.

Both of these machines will use series welding. The first will make 20 spots at once; the second probably will make as many as 40 in three quick cycles. • •

Increased Use Of Aluminum Tank Vehicles

PITTSBURGH, PENNA.: Based on current production trends, one of every two tank vehicles soon may be aluminum, it was predicted by the Aluminum Company of America.

Increased payload capabilities, aluminum's compatability with the majority of liquid and bulk commodities and ease of cleaning are responsible for the trend.

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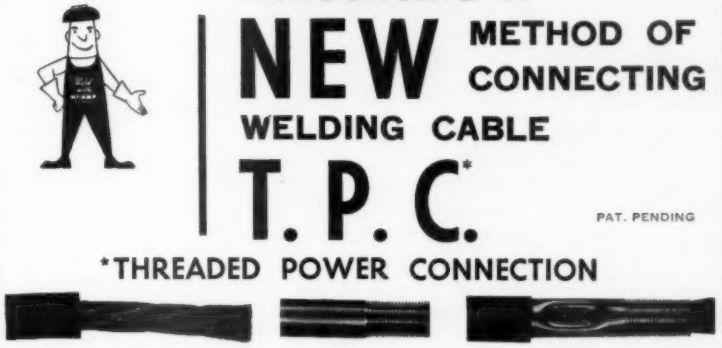

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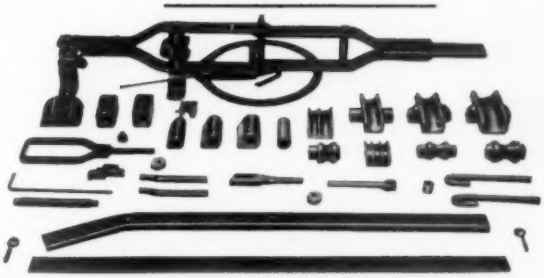

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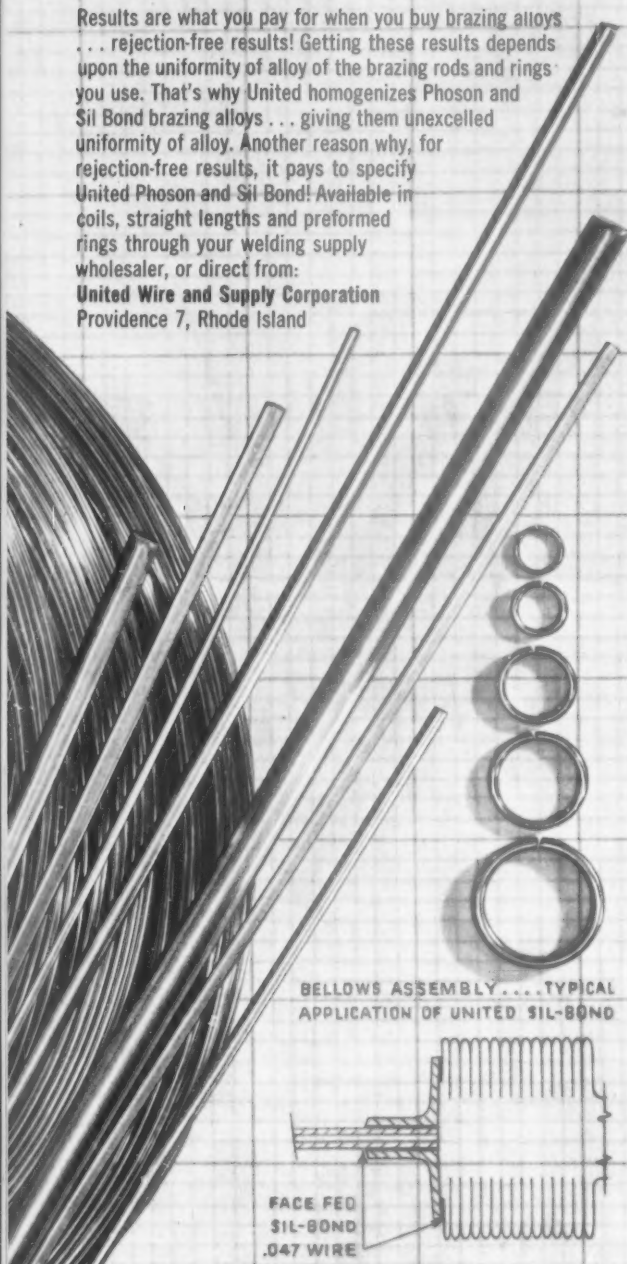
United Wire and Supply Corporation
Providence 7, Rhode Island



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UNITED

INERT ARC SPOT WELDING

continued from page 31

Either timer may be selected by moving a slide switch on the gun—a feature which minimizes steps.

The gun has a ceramic cup locator. Using one type (there are others for making corner or angle welds), the operator slides the locator to the edge of the upper sheet and pulls the trigger to make the weld. This feature speeds and unifies weld location. The weld can penetrate a top layer of ⅛-inch metal to any other thickness. In some cases single welds join three and four metal thicknesses on the cabinet. The gun is also used for edge welding two sheets; does it with a minimum of burn-away. Position is no problem; the inert arc spot gun can weld in any position.

During welding, gas flow is very low: helium, 15 cfh; argon, 5cfh. This mixture gives Graco the right degree of weld penetration for cabinet welding (helium penetrates more deeply than argon).

Cabinet steel is 19, 20 and 22 gauge cold-rolled. It is sheared, bent and made up into four subassemblies, which when joined, complete the cabinet. Some 150 spots permanently button each cabinet. These are spaced about every 4 inches, take less than ½ hour to do.

Graco turns out about 15 cabinets each shift now that they are using the spot gun. The cost savings, which include reduced handling, clamping, and finishing, reaches 60 percent for some cabinet models. • •

TREPAN JOINT

continued from page 34

well as the horizontal position without difficulty.

Preparation of the weld for all automatic TIG welding is of extreme importance. The materials must be clean and free from all dirt, grease or foreign matter at least within the heat affected zone of the weld. Mechanical preparation should also be made to as close tolerances as can be held economically to permit automatic welding. • •

HIGH TEMPERATURE BRAZING

continued from page 37

The 0.060″ thick tip cap is high-temperature brazed into the recessed blade tip. This cap seals the coolant hole access cavity and in effect created a manifold chamber.

They investment cast the blades from chrome-moly-vanadium, high strength-low alloy. The axial coolant holes sometimes were cast in the blades: the lateral and base holes are drilled.

Solar found that chromizing these blades made them resist oxidation, corrosion, and erosion. They chromize before the blade components are brazed. They hydrostatic test blades

←For More Information Circle No. 65 on Reader Service Card.

at room temperature to 30,000 psi to establish best brazing conditions. For acceptance check they used 20,000 psi.

AFTERBURNER:

Liner: To get a material that could contain the afterburner heat, Solar made a brazed sandwich marcel. (See Figure 6)

They fabricated the marcel structure from super alloy L-605 (Haynes Alloy 25). The core is 0.005″ foil in ⅛″ corrugations. Facings are L-605 0.005″ thick. They brazed this marcel at 2,100°F. Note core pattern on facing. This is due to outer facing contact pressure and metallurgical diffusion of the brazing alloy.

Solar found that massive high temperature brazed L-605 assemblies are satisfactory for service temperatures up to 2,200°F. They feel that foil honeycomb or marcel structural sandwich can be used in the 1,500° to 1,900°F range. At these temperatures, their engineers say, you have to look out for thermal aging effects.

These examples are a few of Solar's many high-temperature brazed items. Solar believes, that with new materials, suitable brazing alloys, and manufacturing technique, high temperature brazing will play a major role in the conquest of outer space. • •

SPECIAL FIXTURES

continued from page 40

group. The shop is geared to turn out 25 units in each 8-hour shift.

Assemblies:

The cab assembly consists of three subassemblies—the lower cowl, windshield frame, dash-and-deck assembly. Three men load, fit-up, and secure everything with toggle clamps. They resistance-spot and electric arc the parts into a complete cab. A fourth man surface grinds and cleans it for final assembly. For arc welding they use two 400 ampere D.C. welders. For spot welding they use a 100-KVA transformer type portable spot welder.

The mail truck's roof assembly is made of channel rafters and an angle-iron frame. The frame is covered with 18-gage sheet. This fit-up and welding station is manned by six men. These busy bees arc and spot weld the roof assembly. They use two 100-KVA transformer type spot welders, and four 400 amperes D.C. arc welding machines.

The side door assembly is a 3-man operation. One man uses a fixture to fit-up and tack door-frame and shell. The second and third men shuttle and spot weld the door skin to the frame with 54 spots. Here they use an air-operated press spot welder. The synchronous panel settings were set for single spot, squeeze 25 cycles, weld 55 cycles, hold 20 cycles, off 20 cycles, heat 4 cycles, cool 1 cycle. The vertical electrode pressure was set to give about 1800 pounds. This crew produces 42 doors in an 8-hour shift.

continued on page 50

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RESULTS

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Profitable, rejection-free brazing results depend upon alloy uniformity. That's why United scientifically controls this vital factor through the modern miracle of spectographic analysis, the most positive alloy check ever developed! Another reason why it pays to specify United Sil-Bond and Phoson silver brazing alloys. Available in coils, straight lengths and pre-formed rings through your welding supply wholesaler or direct from:

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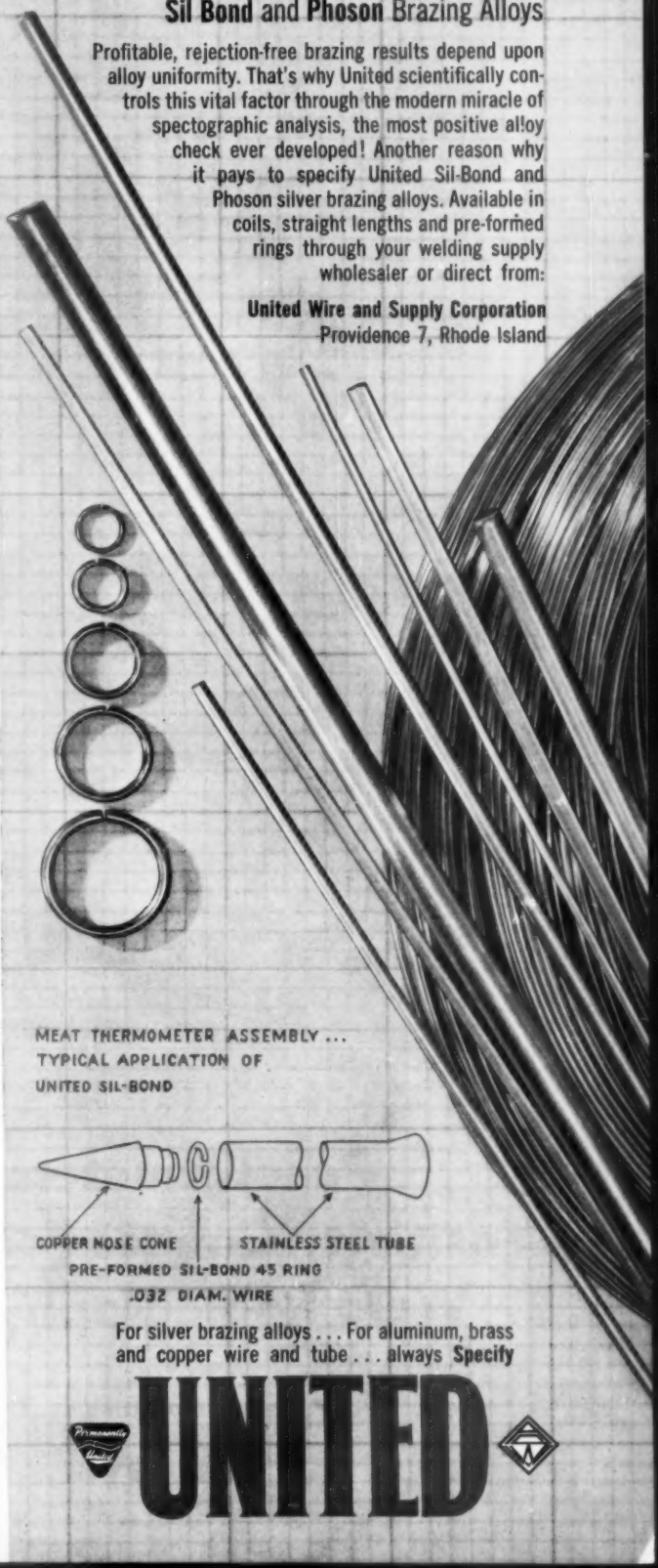

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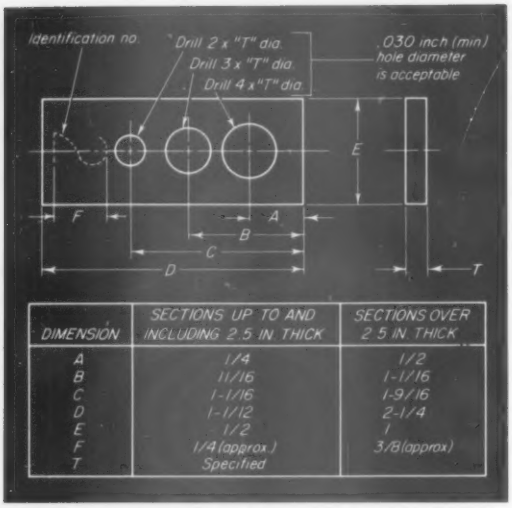
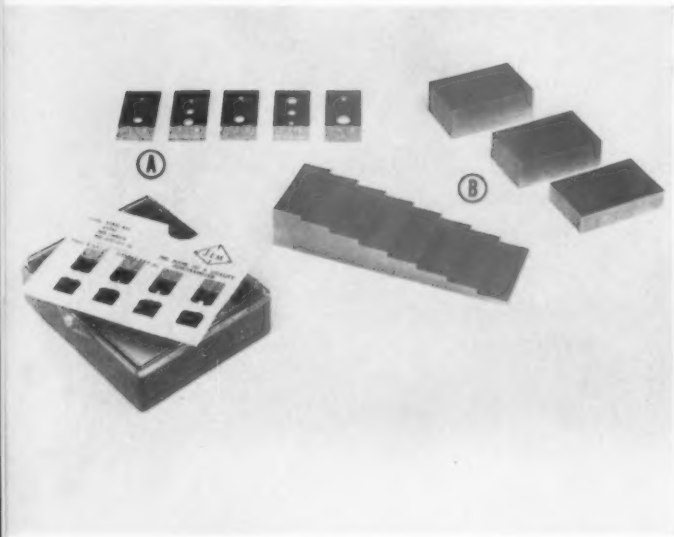


DIMENSION	SECTIONS UP TO AND INCLUDING 2.5 IN. THICK	SECTIONS OVER 2.5 IN. THICK
A	1/4	1/2
B	11/16	1-1/16
C	1-1/16	1-9/16
D	1-1/12	2-1/4
E	1/2	1
F	1/4 (approx.)	3/8 (approx)
T	Specified	

PENETRAMETER DIMENSIONS are determined by using charts like this. Note that thickness (T) is equal to two percent of the object thickness.



TYPICAL are these penetrameters (A) and shims (B).

Penetrameters: Sensitivity Gauges For Weld Radiography

by **ARNOLD GREENE, president**
Jem Penetrameter Mfg. Company
Cambridge, Massachusetts

IN BRIEF: Penetrameters determine that the conditions necessary to produce a readable weld radiograph have been met.

PENETRAMETERS ARE USED to measure the sensitivity of the radiographic technique and source.

Governmental and commercial code-making agencies have agreed that the thickness of a given penetrameter will be equal to two percent of the object thickness; it is made of essentially the same material as the part being radiographed.

As a rule, three round holes are machined in a slip of metal. The diameter of these holes is twice (2T), three times (3T) or four times (4T) the thickness of the slip of metal. Lead numbers are attached to the metal and indicate the object thickness they should be used with. The thickness of the penetrameters is based on the thickness of the metal between the penetrameter and the radiographic film.

The penetrameter is usually placed parallel to the weld and approximately ⅛-inch away on the parent metal. If a backing ring or weld reinforcement has been used, shims of the same metal are placed under the penetrameter to increase the thickness under it to the same thickness as the weld metal. The penetrameter is usually placed on the source side of the weld, but many codes will accept radiographs where it is placed against the film and the metal being radiographed if a technique can be demonstrated to show that the sensitivity can be judged.

Since one object of the penetrameter is to get uniformity in radiographs, it is reasonable to understand that a large tank with a circumferential weld does not need penetrameters on every film if all films are taken at one time using the same technique. It must also be made clear that the penetrameter is not intended to be used in judging the size of a discontinuity, nor for establishing acceptance limits for welds.

The fact that you can see the outline of the penetrameter on the film allows you to decide with reasonable certainty that a discontinuity in the same plane as the penetrameter and more than two percent of the object thickness is not in the weld or adjacent metal. In other words, the outline of the penetrameters tells you that you have contrast sensitivity.

When the image of the hole or holes in a penetrameter are visible, you can determine the detail sensitivity by knowing the "T" thickness of the smallest hole. For example, the outline of a penetrameter used with a 1½-inch thick weld shows very well (good contrast sensitivity) but the hole location of the 3T hole is the smallest hole visible (detail sensitivity). Therefore, a discontinuity that had a dimension less than three percent of the object thickness (three

continued on page 50

Low Temperature EUTECTIC WELDING ALLOYS

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Surface alloying at low heat was first discovered by "Eutectic" in 1904 — used today in over 100,000 plants. "Eutectic" is the originator and sole manufacturer of "Eutectic Low Temperature Welding Alloys" for bonding metals at low heat, minimizing distortion, warping and stress.

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

5 MONTH "DOWN TIME" AVOIDED... COSTS CUT 66%

This pulverizer intermediate ring, used by a cement company, cracked in operation. Replacement posed a difficult and time consuming problem. Obtaining a new ring would have kept the pulverizer out of operation for at least five months.

In spite of the fact that the ring rotates at high speeds and is subject to the shock of impact from heavy steel balls bouncing around and abrasive wear while grinding shale, it was decided to try welding the damaged part.

One of the special problems in connection with repair was that the ring was made of alloy steel and cutting out the cracks became a special job in itself. A cutting torch did not remove metal quickly enough and the high heat involved had a tendency to cause additional cracks and fissures. Grinding wheels were considered, but this would have taken a great deal of time and the tough alloy steel raised havoc with these grinding wheels.

A special oxygenless cutting electrode ChamferTrode was used to gouge out the cracks. This method resulted in extremely rapid removal of the unwanted metal in the area to be welded.

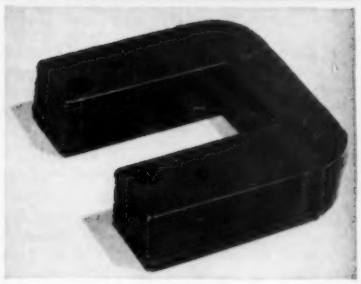
EutecTrode 680 AC-DC was used for the filling operation. This is an extra-high strength, Low Amp electrode, used where embrittlement must be avoided. It provides an ideal hard overlay cushion. EutecTrode 680 AC-DC permits quality welding on pressure vessels, dies, tools and has also seen wide use in rebuilding chemical agitator blades and shafts.

EutecTrode 680 AC-DC also has a "Frigid-Arc" coating — allows smooth, porosity-free dense deposits without spatter, and with exceptional freedom from cracking. Welds are easily deposited at the highest possible speed with least amount of base metal heat, using lowest possible amperage. The ultimate tensile strength, up to 120,000 psi.

Once the pulverizer ring was prepared and readied, weld deposits were completed, then ground flush with the rest of the ring. The mill was then put back into continuous operation with the repaired ring and has operated perfectly in spite of the heavy continuous punishment this part receives.

Materials for the repair were less than 1/5 the replacement cost, and the mill was back in full production in less than three days.

EUTEC-SILWELD 1618 PROVIDES SILVER LINING



A substantial saving was made by a transformer fabricator in laminating coils with paste-on form, silver content alloy, Eutec-Silweld 1618. The paste form eliminated unnecessary handling and waste in replacement of solder strip, and proved considerably faster in application.

Production of Eutec-Silweld 1618 in paste form partially explained its lower heat input. The minute silver particles suspended in flux melt and flow faster than solid silver. It joins at heat input as much as 150°F. less than required for conventional silver brazing material, and the lowest heat range possible for silver content alloys.

In this transformer application, the unusually low bonding temperature with Eutec-Silweld 1618 not only foreshortened induction heat cycle time, but virtually eliminated rejects caused by conventional high heat welding materials.

EutecTrode 680 AC-DC, available in 3/32", 1/8", 5/32", & 3/16" dia. Lt. Blue Tip. Standard weight shipments. • **Eutec-Silweld 1618**, packaged in 8 oz., 1 & 2 lb. jars.

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SPECIAL FIXTURES

continued from page 47

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PENETRAMETERS

continued from page 48

percent times 1½-inches) or .045-inches might not be discernible. The three percent detail sensitivity is not considered good radiographic technique; the standard is two percent. Therefore, the radiographer would have to review his technique and change film, source of radiation, focal-film distance to improve detail sensitivity.

At present, a penetrameter utilizing 1T, 2T and 4T holes is being accepted; levels of inspection where the 1T, 2T or 4T holes must be seen will soon be the order of the day.

The level of inspection will be based on the service requirements of the products, with the most critical parts requiring a visible 1T hole

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Get the lion's share of meaty facts out of this issue of INDUSTRY & WELDING MAGAZINE before you pass it along to the next reader. Leaf through once more: If you want full details on any item, the Reader Service Card will bring them to you quickly. No postage needed.

on the radiograph. It is impossible to emphasize too strongly the importance of clean, round holes, perfectly made so that the technician will not have two strikes against him before he starts. The expert location and sizing of holes will eliminate costly "reshot" expense and allow the conscientious interpreter to do his job correctly.

Whether you buy or make your penetrameters, remember that the detail and contrast sensitivity can only be as good as the gauge used for measuring them. • •

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A SOLDERING SYSTEM has reduced by 50 percent time needed to solder armature coil leads to commutator bars for traction motors at GE's Apparatus Service Shop, Chicago. More than 50 connections are soldered in a single operation in 10 to 15 minutes. Pure tin solder melted in a reservoir pot by three over-the-side immersion heaters is passed through a trough to four cast-in immersion heaters in the soldering ring. An operator controls amount and rate of solder flow in the ring by raising or lowering a cylindrical displacement weight in the reservoir. The armature is preheated to 300°F. Whiting applied to the commutator prevents solder from sticking.

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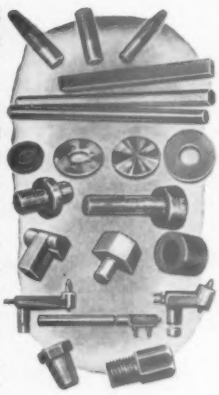

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catalogs, handbooks, manuals

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AN ALL NEW, 84-page catalog said to be a complete source for data on all the "standards" for tool, die, jig and fixture design and applications is available from Jergens Tool Specialty Co. Complete specifications and cost-saving data on over 2,000 "standards" is given in the new 1959 edition of this catalog. **Circle No. 81 on Reader Service Card.**

ABRASIVE DISCS coated by patented Magnecoating, a process that insures greater particle density, more cutting edges and longer life than conventional discs, are described in a 4-page illustrated price list available from Abrasive Company of America. Discs are used for general industrial, sheet metal, soft or semi-soft metals, ceramics, glass and wood. **Circle No. 82 on Reader Service Card.**

A COMPOSITE METAL called Thermo-Lay, said to possess the superior qualities of conventional clad metals, yet costing less, is described in a 4-page data sheet published by the American Silver Company. Thermo-Lay is a hard, dense layer of metal electrolytically deposited, then heat treated to achieve a metallurgical bond to a base metal strip, and finally rolled to finished thickness and temper. Base and overlay metals are listed; mill limits and applications given. **For More Information Circle No. 83 on Reader Service Card.**

SHAPE CUTTING MACHINE, Model SC-42, manufactured by Ohmstede Machine Works, is described in an 8-page, illustrated folder available from them. Features described are: ease of operation; unlimited shapes; totally-enclosed motor; both spindle and magnetic controls; conveniently located controls; machine complete with base; rigid aluminum alloy construction; and 3 to 30 ipm cutting of 42-inch diameter circles and 89-inch straight lines. **For More Information Circle No. 84 on Reader Service Card.**

EYE-SAFETY BULLETIN (No. 34-L), giving the complete story on Sellstrom "Duo-Tone" (Series 711) plastic frame safety glasses, is available from Sellstrom Manufacturing Co. **For More Information Circle No. 85 on Reader Service Card.**

CYLINDER CONNECTIONS AND BUSHINGS, claimed the most complete line in the welding industry, are described and illustrated in an 8-page price list offered by the Burdett Oxygen Company. Among the many items included are: hose couplers; outlet bushings; nuts and nipples (individually and in combination); nuts and nipples for most gases; adapters; ferrules; and many others. **For More Information Circle No. 86 on Reader Service Card.**

AIR HOIST LINE. Complete specifications, operating data and accessory information on the new line of Yale air hoists are described in a comprehensive eight-page brochure published by Yale Materials Handling Division, Yale & Towne Mfg. Co. Data sheet shows all critical installation dimensions; photographs show operating features. Line has capacities from 1000 to 2000 pounds in hook or trolley types. **For More Information Circle No. 87 on Reader Service Card.**

ALUMINUM WELDING WIRE must have a high quality surface for high strength work, is the story told in a new booklet available from the Dalweld Company, Inc. The importance of surface is fully covered along with wire availability, sizes, and tempers. **For More Information Circle No. 88 on Reader Service Card.**

continued on page 54

Lincoln

WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS

Oil well pump chain housing is positioned for flat welding with Jetweld. Welding speed is doubled.

OIL FIELD PUMPING UNITS NOW WELDED TWICE AS FAST

Doubling welding shop production without increasing their investment in labor or machines was accomplished by the Parkersburg Rig and Reel Company at Coffeyville, Kansas.

This firm manufactures oil field pumping units. The complete structure of these units is welded and varies in size depending upon the requirements of the well on which they are to work. Bases are fabricated from as small as 8″ 17 lb. beams to as large as 14″ 68 lb. beams. One exceptionally large unit used a 36″ 210 lb. member for the walking beam.

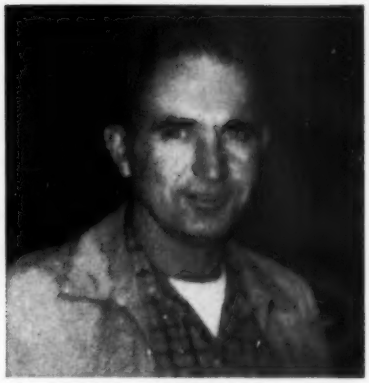
Under the supervision of Jess Kern, Plant Manager and Sammy Doss, Welding Foreman, tests were conducted in the Parkersburg shop in an effort to increase welding efficiency.

A Lincoln welding engineer, Robert Clipsham, surveyed the welding operation. He studied the procedures used and conducted tests with various electrodes and equipment.

The survey indicated that with minor positioning changes almost every weld could be made with a faster, easier-operating iron-powder electrode.

Parkersburg is now using Jetweld 1 electrodes almost exclusively. Mr. Doss says, "Jetweld is twice as fast as the conventional electrodes we were using. It gives us better looking welds, mileage per rod is greater, and weld cleaning is much easier and faster."

Completed chain housing mounted on base fabricated from I beams.



Sammy Doss, Welding Foreman at Parkersburg Rig and Reel has switched to Jetweld almost exclusively.

For help with welding procedures and cost reduction ideas call your Lincoln welding engineer today.

NEW WELDER TAILORED TO YOUR NEEDS

The new Lincoln Idealarc "TM" welder has been designed to meet the needs of any shop.

The key to the "TM" model's versatility is a wide range of options that expand the uses for the machine.

These new Idealarcs are available in 300, 400, 500 and 650 amp sizes.

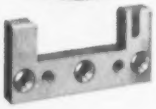
Bulletin 4607.1 has all the details. A copy may be obtained by writing The Lincoln Electric Company.

The LINCOLN ELECTRIC CO.
Dept. 1854 · Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

For More Information Circle No. 43 on Reader Service Card.

Circle No. 64 on Reader Service Card.

TUFFALOY®



Quality, Precision, Service!

The same high-quality alloys used in TUFFALOY spotwelding tips supply the forgings and plate stock from which these resistance welding parts are made.

Seam Welding Wheels are finished to your specifications or supplied as rough forgings; consult the TUFFALOY stock list for sizes immediately available. Replaceable rings are often economical to retread larger or water-cooled wheels.

Special Tuffaloy Parts, such as the two dies and the seam welding shaft shown here, are other examples of what TUFFALOY means to you in *quality* alloys, *precision* machining, *prompt* service.

Tuffaloy resistance welding alloy products are widely available through Airco and Tuffaloy representatives. Call on them for SPOTWELDING TIPS (Standard, 'Tuffcap', Cold-Bent, and Special), Holders and Adapters, BAR STOCK, FORGINGS, SEAM WELDING WHEELS, and all other welding alloy needs. Ask for Catalog and Price List.

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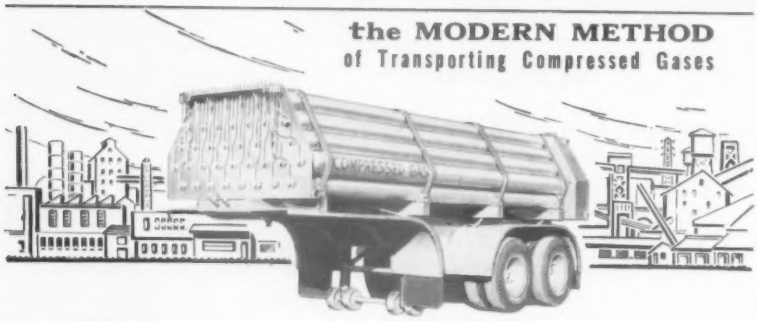

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- CHASSIS — by leading Chassis Manufacturers with Service Branches throughout the United States for YOUR Convenience.

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CYLINDERS AND GAS PRODUCING EQUIPMENT
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O'FALLON 2, ILLINOIS

For More Information Circle No. 36 on Reader Service Card.

USEFUL LITERATURE *continued*

A TWO-COLOR ENGINEERING DATA-SHEET (Number 5) available from the Stainless Processing Division, Wall Colmonoy Corp., discusses W. G. Nicrobraz, a nickel-base brazing alloy for joining stainless steel surfaces with large clearances. Nominal composition, metallurgical properties and engineering properties of the powder are listed. Methods of application and limitations are included.
Circle No. 89 on Reader Service Card.

A REVOLUTION IN PRESS BRAKE DIES is the way O'Neil-Irwin Mfg. Co. describes its new Di-Acro Rol-Form die. The die is said to be usable on any press brake and is said to form any angle to 60° in any material thickness to ¼-inch without work marking.
Circle No. 90 on Reader Service Card.

A CORROSION-RESISTANT ALLOY made by Haynes Stellite Company is the subject of a 16-page booklet. Latest data is given on the company's "Hastelloy" alloy C. Chemical, physical and mechanical properties, along with a guide to corrosion resistance, are presented through the use of charts and graphs.
Circle No. 91 on Reader Service Card.

PRECISION TUBE BENDERS for use in the aircraft and missile industries are the subject of a comprehensive 20-page catalog issued by Wallace Supplies Mfg. Co. Design details, operating characteristics and suggested applications are given in the well-illustrated catalog.
Circle No. 92 on Reader Service Card.

A LIQUID OXYGEN CUSTOMER SERVICE STATION designed by Ronan and Kunzl, Inc., is a 600-gallon, 245 psig working pressure liquid holder for gas users. It is designed to deliver liquid to an auxiliary vaporizer to meet heavy or peak demand periods. It is equipped with an economizer circuit to relieve and use pressure accumulated during no-use or down time periods.
Circle No. 93 on Reader Service Card.

WHERE AND HOW TO USE WELDING NUTS to best advantage is explained in an illustrated booklet just issued by Owosso Division of Midland-Ross Corp. "Save With Midland Welding Nuts" is a guide to designers that demonstrates the many ways in which welding nuts save time and labor.
Circle No. 94 on Reader Service Card.

INDUCTION HEATING INFORMATION is contained in a 4-page brochure issued by Lepel High Frequency Laboratories, Inc. The brochure illustrates and gives data on their 2½ KW high frequency unit.
Circle No. 95 on Reader Service Card.

PRECISION SURFACE EQUIPMENT is described and illustrated in an 8-page catalog No. 839 available from Challenge Machinery Co. It covers over 300 standard items. Included are both semi-steel and granite surface plates. Also semi-steel angle plates, V-blocks, box parallels, straight edges, bench plates, welding tables, heavy duty work benches, layout plates, lapping plates and similar equipment.
Circle No. 96 on Reader Service Card.

HIGH CAPACITY TESTING MACHINES are featured in a new 12-page brochure from the Tinius Olsen Testing Machine Company. The brochure discusses in detail the various features of hydraulic Super "L" Test-Machine. It includes the advantages of four screw design to give rigidity and crosshead stability under load. Universal testing machines of 1,000,000 lbs. capacity and over, are also discussed.
Circle No. 97 on Reader Service Card.

ULTRASONIC FLAW DETECTOR made by Kelvin & Hughes Ltd., is featured in a 4-page folder offered by the company. It describes and illustrates the Mark 5 flaw detector and its many uses in industry.
Circle No. 98 on Reader Service Card.

AN ALLOY COMPARISON CHART available from American Brazing Alloys Co. lists numerically the entire Ambraze line and its comparison of alloy numbers to the two other leading lines of brazing alloys. The chart allows the buyer to cross reference an Ambraze number at a glance.
Circle No. 99 on Reader Service Card.

COMPLETE FLUX CHART recommending the right one to use for joining any one of 58 metals, is contained in a four-page, illustrated brochure available from Krembs & Company. Chart lists the metal to be joined and the flux to use for gas welding, gas brazing, silver soldering, soft soldering, spot welding, furnace brazing, inert arc and hydrogen welding.
Circle No. 40 on Reader Service Card.

EQUIPMENT FOR ULTRASONIC WELDING is featured in Bulletin 118 issued by Sonobond Corp. Typical applications and equipment to use on each are given.
Circle No. 100 on Reader Service Card.

For More Information Circle No. 56 on Reader Service Card.

SOLD

in the familiar green drum

Warehouse stocks in all important cities and towns.

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EMPIRE STATE BLDG., NEW YORK 1, NEW YORK
PLANTS: Keokuk, Iowa; Pryor, Oklahoma; and Shawinigan Falls, Quebec, Canada

how to put 30¢ out of every $1 . . . back in your pocket

The answer is easy. You *get* 30% greater gas capacity in the all new Coyne 92 acetylene cylinder . . . you *save* 30% out of every *gas dollar* invested. Add to this the *lifetime* investment protection of a filler that will *not crack, settle,* or *separate* from the cylinder wall, and you can see why the 92 is the *greatest advancement* in acetylene cylinder manufacture in 40 years.

Get your copy now of the 92 bulletin . . . it gives the details. Write, or call collect the nearest office.

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For More Information Circle No. 21 on Reader Service Card.

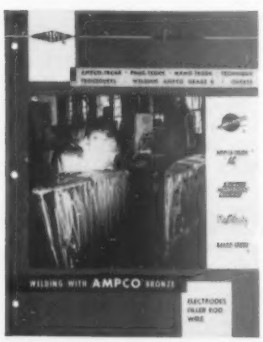
BRONZE WELD DEPOSITS

with AMPCO-TRODE® Bare 36" Filler Rods for the TIG Process

5 grades — hardnesses from 160 to 380 Brinell.

Sound, free-flowing deposits join copper-, iron-, and nickel-base metals and alloys; dissimilar metals and alloys. Used extensively to resist metal-to-metal wear and corrosion.

Ask your Ampco distributor to recommend the right rod for your overlay, fabrication, and repair applications.



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WEST COAST PLANT:
BURBANK, CALIFORNIA
SOUTHWEST PLANT:
GARLAND (DALLAS COUNTY), TEXAS

W-150A

For More Information Circle No. 8 on Reader Service Card.

ALUMINUM MILL PRODUCTS BROCHURE issued by Reynolds Metals Company gives complete specifications for the hundreds of alloys and form of aluminum available from the company. Starting with a description of the light metal's advantages over other materials, the 18-page brochure covers alloy and temper designations, fatigue and shearing strengths, and various alloys available in foil, sheet and plate, wire, rod and bar, tubing and pipe, and extruded and structural shapes. Fabricating and finishing techniques are summarized.

Circle No. 101 on Reader Service Card.

TWELVE-PAGE BULLETIN No. 52112 issued by Federal Machine and Welder Co. describes and illustrates the Warco line of OBI presses in capacities from 40- to 200-tons. Included are charts, sketches and other information useful to the press user.

Circle No. 102 on Reader Service Card.

A NEW PLASMA ARC SERVICE for high temperature metals is described in an 8-page booklet "Linde Plasmarc Plating" just issued by Linde Company, Division of Union Carbide Corporation. The company, using their development, the Plasma Arc Torch, which operates at ultra-high temperatures, does both coating and fabrication of shapes in tungsten, molybdenum, zirconium, tantalum, stainless steel and other metals. The booklet tells what metals can be processed, describes applications by industry, lists design requirements, and describes their high temperature-high velocity testing service.

Circle No. 103 on Reader Service Card.

ELECTRIC CONTROL VALVES and push button torch lighter, designed to make flame cutting more efficient, cuts higher quality and more economical, are described and illustrated in a 4-page, punched-hole folder offered by Indiana Oxygen Company. Switch positions for the Flame Master are: A—All Off; B—Motor only; C-Preheat and lighter; and D—Preheat, cutting-oxygen and motor.

Circle No. 104 on Reader Service Card.

A NEW TUBING CHART offered by Peter A. Frasse & Co., Inc., explains the method used for calculating the tube size required to machine to a finished dimension. The chart gives typical examples to follow and clearly explains differences in OD and ID chucking. It also illustrates from a machining viewpoint the dimensional variations in tubular sections. Printed on durable cardboard stock, the chart is 8½- by 11-inches, tabbed for easy filing and ready reference.

Circle No. 105 on Reader Service Card.

SPECIALIZED WELDING MANUAL, "A Manual for Maintenance and Damage Repair of Aluminum Tank Trailers," has been prepared by Aluminum Company of America in cooperation with several tank manufacturers. Minor and major repairs and modifications are covered; joints, gases, alloys, techniques, and welding electrodes, are included. Eight tables show diagrams and dimensions; 30 illustrations show preparation and welding sequences.

Circle No. 106 on Reader Service Card.

A GRINDING WHEEL CATALOG from Chicago Wheel & Mfg. Company contains 12-pages of information on a variety of wheels. Vitrified, resinoid and rubber-bonded wheels are arranged for easy ordering. Additional information covers wheel shapes and markings.
Circle No. 107 on Reader Service Card.

WELDING POSITIONERS made by Harnischfeger Corp. are the subject of a new 16-page booklet. Nine heavy-duty models, ranging from 3000 to 100,000 lb. capacity, are illustrated and described in detail along with many new features and accessories.
Circle No. 108 on Reader Service Card.

LOW-FREQUENCY INDUCTION HEATING with Smith-Dolan Systems marketed by Electric Arc, Inc., are the subject of a new 4-page illustrated catalog. A complete line of equipment for pre-heating, stress relieving and production heat-treating is featured.
Circle No. 109 on Reader Service Card.

NEW WELDING FUME EXHAUSTER developed by Car-Mon Products, Inc., is featured in comprehensive catalog. How Dual Tab-L-Exhauster assures on-the-spot efficiency with powerful suction in a magnetic-base receptor is explained. Cost and installation information is given.
Circle No. 18 on Reader Service Card.

TEN "DO'S" AND TEN "DON'TS" of grinding wheel safety are listed on a bright red, white and black 12- by 12-inch wall chart issued by Carborundum Company. Terse, easy-to-read and easy-to-remember copy is used on the chart which is designed for hanging in various shop and office locations.
Circle No. 110 on Reader Service Card.

HEAVY-DUTY ELECTRIC TOOLS for industry and contractors are featured in Milwaukee Electric Tool Corporation's Catalog G6-(1). Design details and operating specifications are given for a complete line of tools, including those for weld grinding and finishing.
Circle No. 111 on Reader Service Card.

AUTOMATIC WELDING MACHINERY made by Airline Welding & Engineering is the subject of Bulletin No. 5-12-57. Featured are multi-purpose machines and positioners for use with all welding processes. Specifications are given. Also featured is a welding planishing machine for cold working and smoothing fusion welds.
Circle No. 112 on Reader Service Card.

Longer runs *pay off in resistance welding, too!*

For more mileage between dressings, use AMPCO-WELD® Electrodes

Send for catalog, price list, and name of your distributor

AMPCO®

AMPCO METAL, INC., DEPT. 177E, MILWAUKEE 46, WIS.
WEST COAST PLANT: BURBANK, CALIFORNIA
SOUTHWEST PLANT: GARLAND (DALLAS COUNTY), TEXAS
RW-26

For More Information Circle No. 9 on Reader Service Card.

Tempilstik°

*temperature indicating crayons**

**Also Tempil° Pellets and Tempilaq° (liquid form)*

Tempilstik°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.

Send for *free* sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

SALES DEPARTMENT

Tempil° CORPORATION
132 West 22nd St., New York 11, N. Y.

Circle No. 61 on Reader Service Card.

WELDING MANAGEMENT

• *watches these developments*

SHOULD YOU LEASE RESISTANCE WELDING EQUIPMENT? That's the title of an article which will appear in the May issue of INDUSTRY & WELDING. Robert Sheridan, president, Nationwide Leasing Company, Chicago, has prepared a series of questions and answers on whether this equipment should be leased or purchased. According to Mr. Sheridan, at the end of 1958 there was approximately $1 million worth of equipment on lease in the welding industry with about $29 million on lease to metals and machinery manufacturers as a group.

HISTORY COULD BE REPEATING ITSELF in the re-birth of electric automobiles. According to F. B. Hubert Advertising Counselors, Detroit, two electric utilities are trying out a fleet of charged cars for use by meter readers. With top speed of 58 mph and a range of 77 miles, they may prove more economical than gasoline-driven.

RESISTANCE WELDING EQUIPMENT SHIPMENTS have shown a favorable gain according to statistics compiled by the Resistance Welder Manufacturers' Association. Shipments for the first two months of 1959 are eight percent ahead of those reported during the same period last year, and February shipments, three percent ahead of January, 1959. Also reported was an increase of 44 percent for the first two months of 1959 in net orders when compared to a similar period a year ago. At the end of February, backlogs of member companies were reported at more than $7½ million.

A PROPOSAL TO COMBINE THE ANNUAL CONVENTIONS of the American Welding Society and the National Welding Supply Association will be discussed by members of the Official Board of the N.W.S.A. when that group meets in San Francisco this month. The first year in which such a combined meeting would be possible is 1961 in New York City.

AN INCREASE IN BUSINESS was reported in the fourth quarter of 1958 by 126 members of the National Welding Supply Association. Sales in that period averaged eight percent better than in the same period in 1957. The biggest gain was 15 percent by the Eastern Zone: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Maryland and Delaware.

Sales for the year compared to those for 1957 were up an average of one percent. Leading was the Eastern Zone with an increase of 6 percent.

TWO STEELS INTRODUCED IN THE PAST YEAR offer greater strength, excellent formability and are readily welded, according to Dr. Clarence H. Lorig, president of the A.S.M. and technical director of Battelle Memorial Institute.

First of two is an air-cooling, ultra-high strength alloy for sheet forms with tensile strengths up to 280,000 psi.

The second steel — hardly out of the laboratory — has shown strengths to 400,000 psi, the highest level ever reached by metal. If production presents no serious problems, it will compete favorably with titanium alloys. It is reported to have high ductility down to -385°F.

A QUARTZ-LAMP RADIANT BRAZING SYSTEM for bonding honeycomb sandwich panels used in aircraft and missile construction has been developed by Armour Research Foundation of Illinois Institute of Technology. Research was conducted for Twin Coach Co. and Grumman Aircraft; it results in a faster lower-cost brazing cycle; also should lead to overall lower-cost production of honeycomb panels.

"CYBERNETICS" is a relatively new word in the syntax of American industry, but it provides the key to important advances in oxygen cutting processes, according to Richard L. Deily, an executive of Messer Cutting Machines, Inc. In a paper titled *"Cybernetics of Oxygen Cutting"* which he delivered at the American Welding Society annual meeting in Chicago last month, Deily defined "cybernetics" as "automated processes for greater profits". He cited the application of electronic controls to oxygen cutting machines that now permit use of 1:1 and 1:10 scale drawings and remote control from any location. And most important of all for future development, taped information from computers can be analyzed and used for furthering such processes, Deily said.

FEBRUARY STEEL PRODUCTION WAS UP SHARPLY according to the American Iron and Steel Institute. Steel production totaling 9,603,000 net tons during February, 1959, was the highest monthly total since 9,792,323 tons made in May, 1957, according to a preliminary report. The new figure is an increase of over 285,000 tons, as compared to the ouput of ingots and steel for castings in the longer month of January, 1959, and nearly 3,821,000 tons higher than the production of February, 1958.

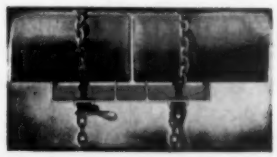
A LEADING COMMERCIAL FINANCE COMPANY has announced a new milestone in American finance. The company will embark on a program of offering long-term (5-year) capital financing to growth corporations in the welding industry, with a minimum of $100,000 and a maximum of $1,000,000 to any one company. Announcement was made by Sidney Feuchtwanger, president of Commercial Discount Corp., Chicago.

WINDOW DISPLAYS highlighting "April Is National Welded Products Month" went over with a bang in Saginaw, Bay City and Flint, Michigan, according to James N. Alcock of Saginaw Welding Supply Co. Chairman of "National Welded Products Month" for the AWS's Saginaw Valley Section, Alcock reports a tremendous response from retail merchants, bankers and hotel managers who were asked to display welded products and welding equipment in windows and lobbies during the week of April 6-10. Display managers of large retail stores were happy to find a fresh approach to *show and sell* welded products because they feature strength and economy.

A PLANNED SCIENCE INDUSTRY CENTER has been established to meet the needs of science-oriented industries seeking suitable accommodations at the nation's capital. Designed for such industries, and to meet the growing demand for efficient plant sites as well as prestige location, Washington-Rockville Industrial Park is situated in Montgomery County, Maryland, only a few minutes away from key government agencies.

Circle No. 76 on Reader Service Card.

SEE JEWEL FOR . . .



The JEWEL Pipe Clamp
. . . aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8" to 16". Sturdy construction for hand usage.

The JEWEL Elbow Clamp
. . . lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

The JEWEL Pipe Marker
. . . marks a perfect hole and saddle on any pipe up to 20".

The JEWEL Angle Clamp
. . . holds branch line at right angles to the main or headers. Takes any size main or branch from ½" to 12".

The JEWEL Flange Clamp
. . . lines up the flange face at right angles to pipe end and holds until tacked. Takes size from 2½" to 16".

Write for Details

Jewel Manufacturing Co.
1841 University Ave., St. Paul 4, Minn.

PLASTIC WELDING

VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

Industry & Welding
812 HURON ROAD
CLEVELAND 15, OHIO

How small and medium size castings are processed

1. Shotblast to remove sand and scale
2. Flame cut gates and risers
3. Inspect surface
4. Make weld repairs
5. Chip or hand grind welds
6. Heat treat
7. Shotblast
8. Final inspection

SMALL castings that need welding go through in-line booth at upper left; others bypass it on right.

MEDIUM sizes are flame trimmed on a giant lazy susan after coming out of shot blast cleaning. Then they are . . .

Production Line Welding And

IN BRIEF: Massillon Steel Castings processes castings by size on smooth-working production lines. High quality weld repairs are verified by radiographic and magnetic particle inspection.

How far should a custom shop go in production line processing if their lots are small? "All the way," says Bernie Pizzino, Foreman of Cleaning Dept. of The Massillon Steel Casting Co., Massillon, Ohio. "Though our orders seldom top 200 pieces, we process a lot of orders. With our production lines, castings are better, costs are less."

Bernie's talking about the many steps it takes to make a steel casting. When shaken out of the mold each casting has fins, gates, and risers to remove. After this is done any surface defects are prepared for the finishing operation by welding.

Bernie showed us the two main production lines, one for large castings up to 4000 pounds, another for smaller castings up to 1000 pounds.

The big casting setup has eight fabricated metal welding booths in a row. Each pair has a common rolling door, welding and cutting equipment and a 2-ton hoist. This is an efficient arrangement. They can prepare castings for welding (by chipping or compressed air-arc gouging) in one booth while the operator is welding in the other. When he welds all the pieces in one booth he moves to the prepared pieces in the other, closes the door and strikes his arc.

"Our operators don't waste time with this setup," says Bernie. "One reason is that they are on an incentive bonus system; meters in each booth show the exact arc time. Anything over the standard means more money in their pockets. Our chippers are also paid by the recorded clock time. The air used passes through an airflow meter which operates the clock that records the time the operator is using the chipping hammer."

You say—"there goes quality; the operators go like blazes, earn a fat bonus, but the castings are full of pits and slag."

Not on your life! The operators are proud of their welding skill. Regular checks are made by the inspection department on all critical areas by the use of x-ray, gamma ray, or magnetic particle inspection. If the quality of the weld is below standard, the defect must be repaired again.

There are two roller conveyor lines for small

Large castings go through these steps

1. Shotblast
2. Flame cut gates and risers
3. Remove fins etc., with carbon-air torch
4. Swing grind riser stumps flush
5. Inspect surface
6. Chip defects
7. Make weld repairs
8. Chip or grind repairs flush
9. Heat treat
10. Sandblast
11. Final inspection

transferred to a double roller conveyor one going through a welding booth.

BIG CASTING defects are compressed air-arc gouged (left) then consumable CO^2 welded (right). Many jobs require manual welding with alloy electrodes.

Cutting of Small-Lot Castings

castings, one for very small sizes, the other for medium. As the castings go down the lines they are inspected, chipped and ground, welded if necessary, rechipped and ground. The very small castings ride in tote boxes, are ground on stand type units. They use portable chipping and grinding equipment on the bulky medium sized castings.

Bernie showed us where medium sized castings lose their gates and risers. From the shotblast room they are dumped on a giant Lazy Susan and an oxyacetylene torch does the rest.

Coming off all three lines castings are straightened if necessary, and heat treated. If of alloy steel, they're straightened hot, low carbon grades are done cold.

What kind of welding? According to Jerry Hathaway, process engineer, 10 percent of the arc time at the Massillon Steel Casting is taken by CO-2 welding. This is done on the heavy castings which naturally need the most deposited metal. Medium and lightweight castings are welded manually with E 6015 and E 7015 electrodes, or other alloy electrodes that will meet the properties of the casting being repaired. Carbon steels with over .30 carbon, and alloys, are preheated before welding. "We just don't take chances," said Jerry.

Supporting Jerry's statement are the spot radiographs periodically made. Of course, some orders are radiographed under contract. In all cases, stressed or doubtful quality casting areas are radiographed.

Besides repair welding, Massillon Steel Castings also welds two—or three piece casting assemblies. The uniform, nondirectional grain structure of steel castings make them an ideal material to weld. Their distortion and stresses are usually less than a material (like rolled steel) having directional properties.

Weld grooves between castings usually have a 70 to 90 degree included angle. Preheat is determined by the material being joined, the same as in repair welding. Heating is continued during welding as long as necessary.

What is the aim of a foundry like Massillon Steel Casting Co.? Close cooperation with the customer is the main one—to give him castings that fit his needs—in soundness, chemistry, properties, and surface finish. With their experience, the company is able to advise the customer on casting design and composition to help improve the end use of the castings. ••

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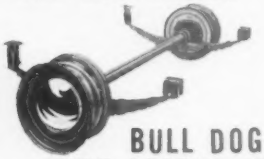
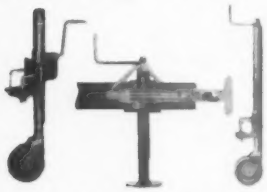


BULL DOG AXLE ASSEMBLIES

BULL DOG JACKS



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Complete Spindle End Assemblies for 2,500, 4,000 and 5,000 lb. capacities Per Pair. Available in complete assemblies or individual parts — Spindle Ends, Hubs, Wheels.

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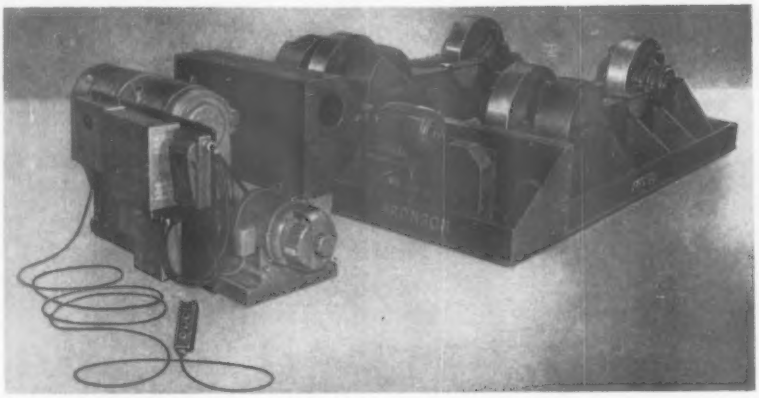
NEW PRODUCTS



400-Ton Capacity Turning Rolls

Two new 400-ton capacity turning rolls have been added to the Aronson Machine Company's line of turning rolls for automatic and manual welding of cylindrical vessels. When used in conjunction with each other, Models WSD400S1G and WSD400-S2G are designed for smooth rotation of heavy walls vessels for welding or cladding, such as encountered in nuclear reactor projects.

Hardfaced 30-inch precision machined wheels with 7-inch face safely and accurately support loads in excess of 400-tons. These rolls provide four selective speed ranges from 4 ipm to 80 ipm for smooth positioning of vessels ranging from three to 14-feet.

Slave motors on each unit are synchronized by a remote power source and provide positive traction pull at wheels for 500-tons. Anti-friction bearings, heavy plate construction and welded steel gear cases are standard equipment.

For More Information Circle No. 120 on Reader Service Card.

Temperature Indicators

Newly developed are the Tempil Corporation's Tempilstiks, Tempilaq, and pellets for indicating temperatures in the 331 to 344°F range. These indicators have a sharp, rapid melting action at predetermined temperatures, are an easy way to insure proper preheat and interpass temperatures for welding. The full Tempil line of indicators covers a range of 113 to 2500°F.

Circle No. 61 on Reader Service Card.

New 50 Foot Power Tape

Evans Rule Company has added the new Power Fifty to their line of power tapes. This 50-ft. model featuring a patented control speed blade return eliminates tedious hand-winding. Gentle pressure on the power button returns the extended blade into the case.

The rule mechanism is made of rugged molded nylon. The case is made of tough vinyl-leatherette that resists moisture, scuffs and stains. The blade has black markings on a white background. It is foot-flagged every inch and graduated in eighths.

Circle No. 26 on Reader Service Card.

New Acetylene Cylinder

A new acetylene cylinder announced by Coyne Cylinder Company is said to cut capital investment and operating costs from 10 to 30%. This saving is the result of a newly formulated filler now used in the "92" acetylene cylinder. The filler is capable of absorbing from 10% to 30% more active acetylene gas, depending on size of tank in which it is used. The high porosity of this filler also speeds refill time by the same percentages.

Circle No. 21 on Reader Service Card.

continued on page 64

FACTS AT YOUR FINGERTIPS: *Do you want full information on the latest welding products shown on these pages? Just circle the appropriate number on the bound-in readers service card and you'll get it.*

PRO GETS NEW LOOK AT WELDS WITH X-RAY

Learns to use portable Baltospot in a matter of hours

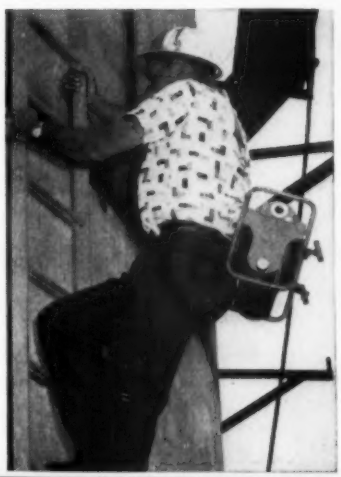
SO COULD YOU! There's no mystery about taking your own weld X-rays. You or your men can learn to make good radiographs in less than a day—with Baltospot portable X-ray equipment.

There are only three simple steps:

1—Measure thickness of part and refer to chart
2—Make exposure
3—Develop film according to chart

Nothing could be simpler. It's a terrific cost-cutter, too (77 percent savings on inspection costs were recently reported by a prominent tank fabricator). And a real incentive for maintaining good weld quality—keeps the occasional faulty weld from becoming a costly repetitive fault.

Your Westinghouse X-ray representative has the whole cost-saving story on Baltospot portable X-ray equipment. Or write: Westinghouse X-ray Department, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-08377



YOU CAN BE **SURE**...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

For More Information Circle No. 75 on Reader Service Card.

For More Information Circle No. 49 on Reader Service Card.

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Flood FIBER GLASS WELDING HELMETS
For Safety, Comfort and Economy

These seamless fiber glass units (of thermo-setting, polyester resin) are compression-molded and stoutly reinforced to afford maximum protection. All are fitted with a new ratchet type head gear which adjusts to size with the flick of the fingers. Headgear material (of high impact plastic) is smooth, easy to clean and unaffected by chemical reaction.

No. 51-8F-P14

NEW DESIGN ADVANTAGES

1. Lighter weight for more comfort.
2. A smoother and stronger shell.
3. Easier cleaning and sterilizing.
4. Non-warping moisture-proof construction.
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No. 53-8F-P14

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Enjoy real savings with Flood's
1000-HOUR COVER LENS
Outlasts 125 glass lenses. Reduces eye fatigue. Safer because shatter-proof.

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See us at Booth No. 15, N. W. S. A. Convention, San Francisco, May 4-6
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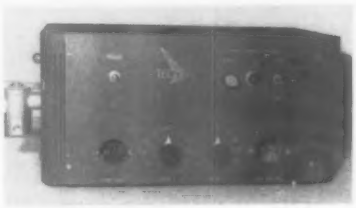


Control Unit For Tig Spot Welding

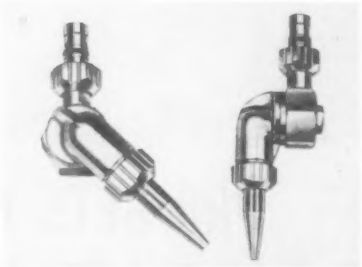
A new control unit introduced by Tec Torch Co., Inc., converts any DC power source into a Tig spot welding machine. It is said to be the only control unit of its kind.

The Tec spot control unit is a lightweight and compact portable unit which operates on 110 volts. This control unit can be installed in minutes and does not require skilled operating personnel. It can be transferred from one power source to another quickly and easily.

The instrument panel is designed for quick, accurate reading and contains visual power and gas flow indicators.

A unique feature is two timers which control the amount of time in cycles that the current flows for each spotweld. Each of these timers may be preset and selected for operation from a separate slide switch mounted on the company's companion Tec spot gun. Timer also controls gas flow. The gas flow is initiated with high frequency so that the gas is flowing before the welding current starts.

Circle No. 121 on Reader Service Card.



New Attachment For Bevel Cutting

A beveling attachment that enables a torch operator to change the cutting angle without extinguishing the flame has been introduced by Smith Welding Equipment Corp. Designed principally for bevel cutting with a machine torch, Smith's new SC290 attachment is calibrated in increments of 15° to 90° on each side of vertical to permit cuts at most angles. The absence of stops on the swivel member also permits reverse beveling.

Flexible seal rings imbedded in machined grooves keep the gases separated until they mix properly in the tip. They also make possible

hand adjustment of the head, and prevent foreign matter from entering and causing damage to the seat.

The head of Smith's attachment can be swiveled through its entire arc without extinguishing the preheat flame. The design also permits a change from bevel to vertical cutting and back again without a need for flame adjustment.

For straight line cutting of metal up to ⅜" thick, the tip can be angled forward up to 30 degrees to increase speed. The SC290 also simplifies manual cutting of heavy channel or I beams.

Adaptable to standard cutting machines equipped with Smith's torches, the unit weighs 19¼ oz. without the tip. In vertical position, it measures 5¼" from tip end to the torch.

Circle No. 122 on Reader Service Card.

Safety Goggles Frames

A new line of fast-fitting safety goggle frames to accommodate plastic, glass and prescription lenses has been announced by Watchemoket Optical Company. These frames feature: Patented Retrax temples which wearer telescopes in or out for a perfect, comfortable fit; a universal nosebridge which rests comfortably on any shape nose; a spread-end frame which facilitates 60 second lens replacement. The frames are available with or without side shields, and with plastic or hardened safety glass, clear or green, S7 lenses.

Circle No. 123 on Reader Service Card.

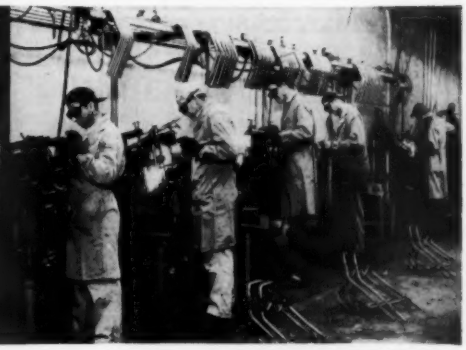
Welding Glove

A new Montpleier pattern welding glove introduced by Riegel Textile Corporation features an extra long, long-wearing horsehide palm that helps avoid seam chafing at the wrist. Other features: Welted, spark-resisting seams, and lined cuff and thumb.

Circle No. 124 on Reader Service Card.

For More Information Circle No. 4 on Reader Service Card.

TOP QUALITY
FLUXES
made by All-State for
WELDING
BRAZING
SOLDERING



Production line brazing with automatic fluxing system. Information on All-State JET FLUX® on request.

POWDERED flux is micro-ground;
PASTE flux is homogenized

At ALL-STATE each flux is manufactured to rigid specifications, tailored for best results with specific alloys. For example, ALL-STATE's S-200 silver brazing flux affords complete protection to heated base metal to 1800° F., insuring excellent capillary action and easy flowing of silver alloy. Melts at 600° F. Equal care is built into other fluxes made by ALL-STATE to assure oxide-free bonding of all metals at low temperatures.

Ask for free copy of 58-page Instruction Manual. Write for information on fluxes custom coated on your own rods.

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ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.
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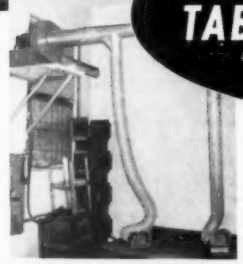
OUT GO WELDING FUMES

Right from the Source

(Pat. Pending)

CAR-MON DUAL TAB-L-EXHAUSTER
assures "on-the-spot" efficiency with powerful suction in magnet-base receptor



Newest development by **CAR-MON,** specialist in carbon monoxide removal for garages and repair shops . . .

Lifetime magnet-base holds exhaust receptor fast on work or nearby metal. No bulky counterbalances needed. Flexible tubing gives full, easy maneuverability. Car-Mon's simple installation thoroughly exhausts gases, smoke and heat . . . gives practical, low-cost air cleaning for any shop layout.

Write for full details and catalog.

CAR-MON PRODUCTS, INC.
1541 W. Devon Ave., Chicago 26, Ill.

For More Information Circle No. 18 on Reader Service Card.

Protective Heat Cloth

An approved heat cloth consisting of aluminum sheet foil laminated on glass cloth fabric is being marketed under the "Ray-Foil" name by Frommelt Industries. This new fabric gives positive protection by reflecting radiant heat just as a mirror reflects light.

The cloth is said to be flexible and easy to use as a curtain, shield or panel. It is available in 36-inch widths with panels buttoned together to make any length or height required. Eyelets are standard equipment on all four sides of the curtain.

A portable frame to which curtain is attached is available.

Circle No. 130 on Reader Service Card.

New Resistance Welding Alloy

A new alloy of copper and zirconium for resistance welding has been developed by P. R. Mallory & Co., Inc. The new alloy, Mallory "28" Metal, has exceptionally high electrical and thermal conductivity coupled with high strength and hardness. The properties of the material are developed through a combination of cold working and heat treatment.

The elevated temperature characteristics display unusually good resistance to annealing or softening and its ductility is such that Mallory 28 should not check or crack when highly stressed at elevated temperatures.

Mallory 28 is also recommended for spot and seam welding of aluminum and magnesium alloys, and steels having low melting point coatings, such as galvanized, aluminized, terne plate, tin plate and cadmium plate.

Circle No. 131 on Reader Service Card.

Magnetic Particle Inspection Unit

The Detectascope introduced by Ferro Machine & Tool Corp. is a portable magnetic inspection device which detects surface and sub-surface discontinuities in ferrous magnetic materials. The compact unit

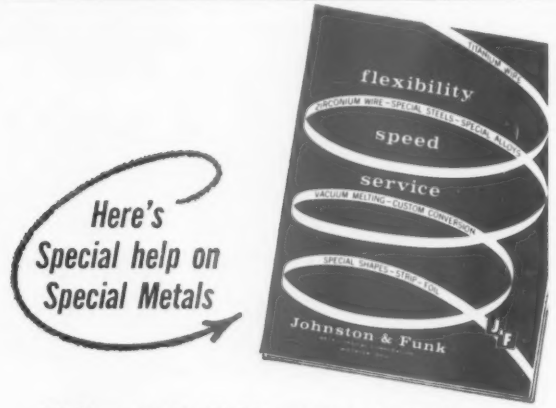
eliminates the necessity for building a black light booth when fluorescent solution is used; it can be used with fluorescent or non-fluorescent solution anywhere a 110V outlet is available.

The unit operates from 110V, 60 cycle, single phase current, has a DC magnetizing output of 5200 amperes from 1.2 amps input. The unit is of metal construction measuring 52¾-inches high, 36-inches wide and 18½-inches front to back. It weighs about 150 pounds.

Circle No. 132 on Reader Service Card.

Air-Operated Rocker Arm Welder

A new air-operated rocker arm welder available in capacities from 7½ to 75KVA has been announced



Working with Cb, Hf, Mo, Ta, Ti, Zr, V or W?
Need highly critical special steels and alloys?
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Here are the straightforward facts on a pioneer in special metal conversion... how J&F can provide you with topflight help, fast delivery, competitive prices on ingots, billets, small diameter bars, wire, rod, narrow strip, foil and tailor-mades... how J&F's highly experienced staff works from the initial melt, producing metals of certified quality for military and commercial needs, R & D or production quantities.

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EVANS WHITE TAPES
Sizes from 6 ft. to 12 ft.

NOW EACH IN
BELT HOLSTER

Now, Evans gives industry more big savings in measuring tapes!
Every Evans pocket tape, push-pull and power models, come packaged in a strong, metal-reinforced, vinyl-covered holster with belt clip. Makes measuring faster, tapes always handy.

CLIPS ON BELT!

YOUR COMPANY NAME ON TAPES . . .
Evans tapes supplied with your company name and advertising on each tape for presentation to your customers. A wonderful way to build good will. Available in individual gift package.

Send for illustrated folder #5807.

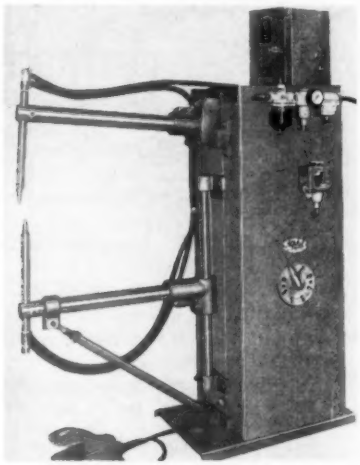
Evans RULE COMPANY
Factories at: Elizabeth, N. J. & Montreal, Quebec

For More Information Circle No. 26 on Reader Service Card.

by Alphil Spot Welder Mfg. Corporation.

The new welder is equipped with: heavy duty heat selector with full load capacity, extra heavy rear switch rod, contact assembly, rugged air cylinder, standard electrode holders, electrodes and morse tapers. The unit is completely water cooled.

The standard model has a maximum spacing of 12 inches between the arms. Special models are available with a 48 inch throat depth and adjustable lower swivel arm having



a maximum spacing of 28 inches between the arms. Timer and contactor are optional features. Modifications to arm length and swivel drop can be made as required.

Circle No. 133 on Reader Service Card.

Abrasion-Resistant Plates

Two developments in heat-treated, abrasion-resistant alloy plates have been announced by Jones & Laughlin Steel Corp. Their Jalloy Grade 3 now comes in four hardness ranges for easier, more accurate selection; their moly-bearing Jalloy now contains copper to better resist atmospheric corrosion. Typical Jalloy uses: bulldozer liners; scraper blades; truck bodies; and deck plates.

Circle No. 134 on Reader Service Card.

Arc Time Recorder

The Arcair Company is marketing the Meltime Arc Time Recorder, an instrument for accurately calculating incentive rates for Arcair metal removal, or welding, work. It records time down to tenths of a minute and the record is plainly visible and readily accepted by management and operators.

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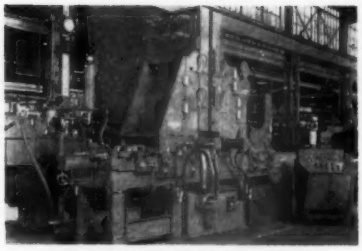


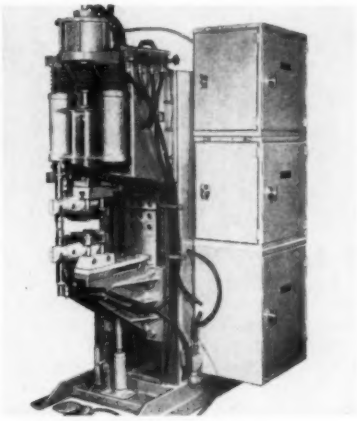
New Flash-Butt Welder

A new flash-butt welder, often referred to as a skelp welder is announced by Sciaky Bros., Inc. This new machine is designed for flash-butt welding of continuous fed hot rolled stock: low carbon steel ranging from .060" to .200" in thickness and from 12" to 22" in width. The machine is also capable of handling a maximum of 4.5 square inch cross section of mild steel, and 2.6 square inch cross section of stainless steel.

The welder has an upset force of 90,000 lbs., and a clamping force of 135,000 lbs. It has a maximum platen opening of 8 inches. The welding current is obtained from air cooled transformers, rated at 400 KVA at 50% duty cycle. Heat control, post heat, and 32 steps of heat regulation are also provided.

The strip movement in the machine moves from left to right. The out going and incoming strip is controlled by gauging bars. After welding the platen returns to its initial position, and the welded strip passes through the plow shear where the flash is removed.

Circle No. 139 on Reader Service Card.



Single Phase Welders

A new line of single phase resistance welders has been announced by the Electro-Weld Division of Electric Arc, Inc. With readily added controls, the new line can duplicate three-phase performance in welding steel, aluminum, bronze, magnesium, etc. Models include press type spot and projection; butt, and rocker arm spot welders in wide KVA ranges.

Circle No. 140 on Reader Service Card.

Hardening Compound In New 3-Ounce Size

A new small-size package for testing purposes has been announced by Hard-N-Tuff Corporation, manufacturers of Hard-N-Tuff steel hardening compound. The new package contains enough Hard-N-Tuff to harden all the chisels, drills, and other tools in a fully-equipped home workshop. It is therefore ideally suited for initial testing of this unique steel hardening process by industrial plants seeking a means of hardening their production tools, dies, jigs and fixtures, or manufactured parts.

Hard-N-Tuff has case hardening qualities which more than triple the life of tools and parts.

Non-toxic and non-flammable, Hard-N-Tuff is applied by a simple heat-treating operation that takes only a few minutes and requires no special equipment.

Circle No. 141 on Reader Service Card.

New Steel Alloys

New types of "SR" (Super-Rust-free) steels introduced by Uniworld Research Corporation of America are said to provide high temperature- and corrosion-resistant qualities for space age applications.

"SR" steels are said to cost considerably less to produce than the super alloys and use none of the so-called critical metals, such as cobalt, chromium, tantalum, tungsten or zirconium, and only relatively small amounts of nickel.

"SR" steels are austenitic, non-magnetic, even after severe cold working; for instance, as a wire of .0035-inch diameter and foil of .0015-inch thickness. They are age-hardenable and have high tensile and high yield strengths.

"SR" steels are available for use in other fabricated forms: plates, sheets, foils, bars, rounds, wire and powder.

Circle No. 142 on Reader Service Card.

Non-Acid Flux

A new hydrazine flux that leaves no resin residue, is non-corrosive, non-hygroscopic and permits pre-fluxing is now available from Fairmount Chemical Company. The non-acid flux, designed for use in soldering electrical and electronic equipment, is said to eliminate costly residue removal and insure corrosion-free joints.

The new flux vaporizes completely in the heat of soldering; no washing is necessary where all fluxed parts are heated to soldering temperature. There is said to be no danger of fungus attack.

Copper, brass, hot tin dipped, hot solder dipped, tin plate and other surfaces can be soft-soldered with this new flux.

Circle No. 143 on Reader Service Card.

Circle No. 11 on Reader Service Card.

GET BETTER ELECTRODE HOLDER PERFORMANCE

Clean jaws increase power flow, welding speed and reduce holder heat, eliminate arcing, pitting jaws and splitting rod coat.

ATLAS "Jaw Cleaner"

Write for Prices

1. CLEANING BROACH

Cleans corrosion, spatter and dirt off Jaws. Does not cut away metal. Double teeth clean in both directions.

2. POLISHING BRUSH

Spiral wire type with long life. Finishes the job with a like-new polish and perfect contact surface.

FOR ANY TYPE HOLDER

Atlas Welding Accessories Inc.
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PORTABLE SANDBLAST GUN Complete: simply connect to air line

RUGGED — EFFICIENT

$27.50 (including one spare jet and 2 spare nozzles)

FOR THE LAB OR SHOP

A complete inexpensive sand blast unit for cleaning before and after welding. For sand blasting metal surfaces or small parts. Order one today. It pays for itself quickly.

LINDBERG PRODUCTS CO.
P.O. Box 908W LAKEPORT, CALIF.

Circle No. 44 on Reader Service Card.

New Machine For Manual Inert Gas Welding

A new Idealarc welder for tungsten inert gas welding has been announced by Lincoln Electric Co. The new machine can be used for conventional metallic arc welding. It is available in the NEMA rated 300 ampere size either as a straight AC transformer welder or as a combination AC and DC rectifier welder. It has a saturable reactor-type control.

Optional features that may be added to either the AC or AC/DC type of welder include: a high frequency kit complete with controls for water, gas and high frequency arc intensity; remote hand or foot control for adjusting amperage; a DC filter to eliminate DC created in the arc when welding with AC and high frequency; a line contactor (starter) with overload protection and either line—or 115-volt push-button; and power factor correction condensers.

Circle No. 125 on Reader Service Card.

8 AC Arc Welders

Eight different models of electric arc welders are now available from Forney Arc Welders, Inc. Including a heavy-duty 350 amp limited input industrial model, the complete line of AC transformer arc welders and accessories fills every industrial need for general purpose welding.

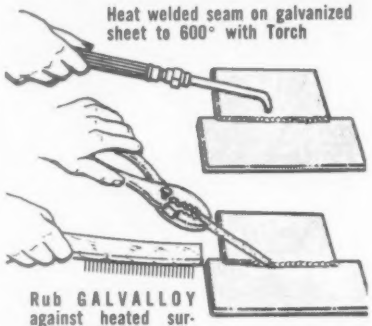
Sizes range from the 5 to 80 amp F-100 welder with six heat stages to the 5 to 350 amp Model I heavy duty service unit with 36 heat stages. This welder has 230 volt primary with maximum line draw of 32 amps and forced draft ventilation.

Welders are waterproofed and insulated for outdoor or indoor service. They accommodate electrode sizes from $\frac{1}{16}$ to $\frac{1}{4}$-inch diameter.

Circle No. 126 on Reader Service Card.

Circle No. 46 on Reader Service Card.

No Other Product Can Do a Galvanizing Job Like *Galvalloy* Does - HERE'S PROOF


Heat welded seam on galvanized sheet to 600° with Torch
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A new 4043 aluminum welding wire announced by Dalweld Company Inc., is specifically designed as an all-purpose filler material for both gas and electric fusion welding. Its principal alloying element is 5% silicon. It will join 5052, 6053, and 6061 wrought alloys and cast aluminum alloys.

4043 is said to produce a wider solidification range because it has a lower melting point than most aluminum alloys. This feature enables the metal to fill solidification voids without setting up stresses in the parent metal. It is also said that the stresses are relieved in the molten welded filler and not in the joined parts.

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Inside-Outside X-ray Unit

A new portable x-ray unit designed for wide-use radiographic inspection of pipe and tank welds, castings, assemblies, and steel structural work has been announced by Balteau Electric Corporation. Unit features 180 KVP-5 MA head which is capable of 360° internal radiography, and outside circumferential work or single beam use.

The Baltograph 180, Panoram-x weighs only 111 lbs., is gas insulated and can penetrate 2¾" steel.

The weatherproof control unit weighs 41 lb., has penetration meter and selector, MA control, and automatic reset timer.

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Silver-Bearing Stainless Solder Alloy

Ambraze #4300 is a new special silver-bearing stainless soldering alloy introduced by American Brazing Alloys Co. This new alloy is said to be excellent for high capillary joining of steel, nickel, stainless, copper, Monel, aluminum bronze, beryllium copper, Elkonite and aluminum and any combination of these metals. Finished joints can be chrome plated.

Ambraze #4300 complies with all Pure Food Laws and is non-toxic. It is said to be ideal for all thin gauge and dissimilar metals. It offers excellent corrosion resistance and can be used with torch or soldering iron with no danger of warping.

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Semi-steel Blocks for layout, welding assembly work, etc., with machined working surfaces; also tools and accessories, including a full line of clamps, drift pins and dogging devices. Standard and special stands can be supplied. A 4-unit set-up, joined and mounted on stands, is shown above.

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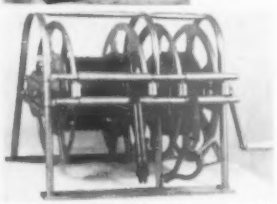

Model 703 "TWIN-REEL" saves cable

The "Pipe-Liner"—capacity 250 ft. ¼-inch welding hose, rotating gas connector —prevents pre-mixing of gases, full width guide rollers, outboard bearing and reel crank.

The "Twin-Reel" — capacity 250 ft. of electrode and 125 ft. of ground cable. Permanent terminal connection, guide rollers with reel selector.

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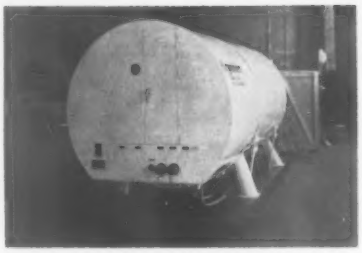

Containers For Liquid Gases

Ronan & Kunzl announces liquid oxygen customer service converters for users of gaseous oxygen/nitrogen and argon.

Model 600, a 60,000 cubic foot liquefied gas container (shown) has a maximum operating pressure of 245 lbs. and can deliver gas up to 5,000 cubic foot per hour on demand, using an automatic valving system.

A built in economizer circuit uses the accumulated gas pressure when the units are shut down over week end and vacation periods. A no-loss liquefied gas system is available in Model 600.

Also available is Model 300, a 30,000 cubic foot customer service station in 150 psig and 245 psig working pressure.

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Coated Abrasive Discs

Up to 200% longer life, 2 to 4 times greater particle density, and more efficient cutting are features of new coated abrasive discs introduced by Abrasives Company of America. Key to this is the patented Magnecoating process which magnetically orientates the particles, firmly imbedded in the adhesive, with the sharpest points up. Discs come in standard grits for all normal grinding and finishing.

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Cylinder Pallet

A new pallet, designed to handle 9-inch diameter cylinders with model sizes designed for 12, 16, 20 and 24 cylinders, has been developed by Weldon Industries, Inc. Of strong tubular construction, pallets can be equipped with either chain or adjustable pipe retainers so that partially filled pallets can be handled safely. Modifications can be had for other cylinder sizes and quantities.

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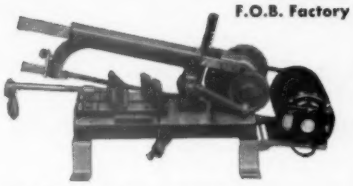

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Cambridge Company (cyrogenic vessels), Lowell, Mass.: Coyne Cylinder Company, 224 Ryan Way, So., San Francisco.

All-State Opens St. Louis Warehouse

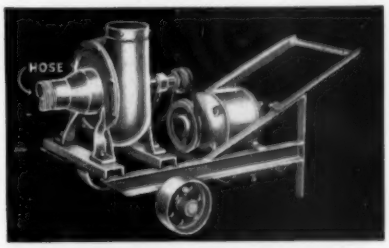
ST. LOUIS, MISSOURI: Opening of a Central Warehouse here at 1523 Broadway has been announced by T. D. Nast, president of All-State Welding Alloys Co. The new warehouse will stock alloys and fluxes and provide one-day service to distributors and users within a 400-mile radius of St. Louis.

David N. Coombs has been named manager. He was formerly associated with Mid-West Tool and Supply Co. and has had several years' experience warehousing and servicing All-State products.

Circle No. 52 on Reader Service Card.

RUEMELIN *Portable* Fume Collector

Removes gas, smoke and heat from welding operations. Recommended for ventilation of tank interiors, manholes, vats, airplane fuselages or for blowing fresh air into inaccessible places.



• Collector is equipped with a power unit capable of handling up to 35 ft. of steel tubing. Mounted on rubber tired wheels for ease of handling. Models also available mounted on steel legs for hose operation in a complete 360 degree circle.

• This view shows inlet hood picking up welding smoke. Operator breathing zone protected.

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WELDING CLINIC

J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Braze Welding of Cast Iron

There are two major obstacles to successful repair welding of cast iron: 1. low-strength and poor ductility of cast-iron weld metal, 2. embrittlement and hardening produced by rapid cooling from fusion-welding temperatures.

Oxyacetylene fusion welds with cast-iron rods have such very low strength and ductility that they often crack under the stresses imposed during welding and cooling. If they survive these hazards, they are likely to fail when subjected to the service stresses that caused the original failures.

Arc welding, because of steep temperature gradients between weld and base metal, is likely to embrittle and harden both weld and adjacent base metal. Here, too, failure may occur during welding and cooling, or later in service. It is usually necessary to resort to carefully controlled schedules of preheating, peening, and post-heating, often with high-cost alloy filler metal, to avoid the twin evils of embrittlement and hardening.

Oxyacetylene braze welding is an excellent solution to the problem for two reasons. With the low temperatures required, there is no rapid cooling from high temperatures and therefore no embrittlement. Excellent ductility and high strength of the weld metal deposited by Tobin Bronze®-481, Anaconda-997 (Low Fuming) Bronze, and Nickel Silver-828, permit yielding while the repairs are being made and after they are returned to service, and the danger of failure is practically eliminated.

The braze-welding operation itself is virtually foolproof because the molten bronze automatically "tins out" or spreads over the joint surfaces when the correct temperature is reached. Since the base metal is not melted, control of the weld metal is very easy and braze welding is readily done in all positions.

ADVANTAGES OF BRAZE WELDING WITH ANACONDA WELDING RODS ARE:

1. Economy in welding time and gas consumption.

2. Development of low residual stresses with less distortion and less tendency to crack.

3. No embrittlement, and complete machinability of the weld areas.

4. Minimum delay in returning the repaired parts to service.

DETAILED INFORMATION AVAILABLE

Detailed suggestions on the methods of chipping grooves, removing oil, positioning the work, and preheating are given in Publication B-13, which gives full information on Anaconda Welding Rods, discusses procedures for welding with copper and copper alloys in a wide variety of applications.

EXTENSIVE BRAZE-WELDING REPAIRS on the frame of this big steam hammer used 1850 lb. of Tobin Bronze Welding Rod — saved six months' production time, for one-fifth of replacement cost.

These are some of the subjects covered: Copper-Alloy Welding Rods in steel sheet metal work, brazing and soldering, resistance welding, surfacing, welding copper alloys to steel, arc welding of copper and copper alloys.

For information on special problems—or for a copy of Publication B-13—write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 58102

WELDING ROD	APPROX. COMPOSITION, %	APPROX. MELTING POINT	
		Deg. C	Deg. F.
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Anaconda-997 (Low Fuming) Bronze	57.80 copper, 40.27 zinc, 0.95 tin, 0.85 iron, 0.10 silicon and 0.03 manganese	870	1598
Nickel Silver-828	48.58 copper, 41 zinc, 10.25 nickel, 0.15 silicon, 0.02 phosphorus	930	1706

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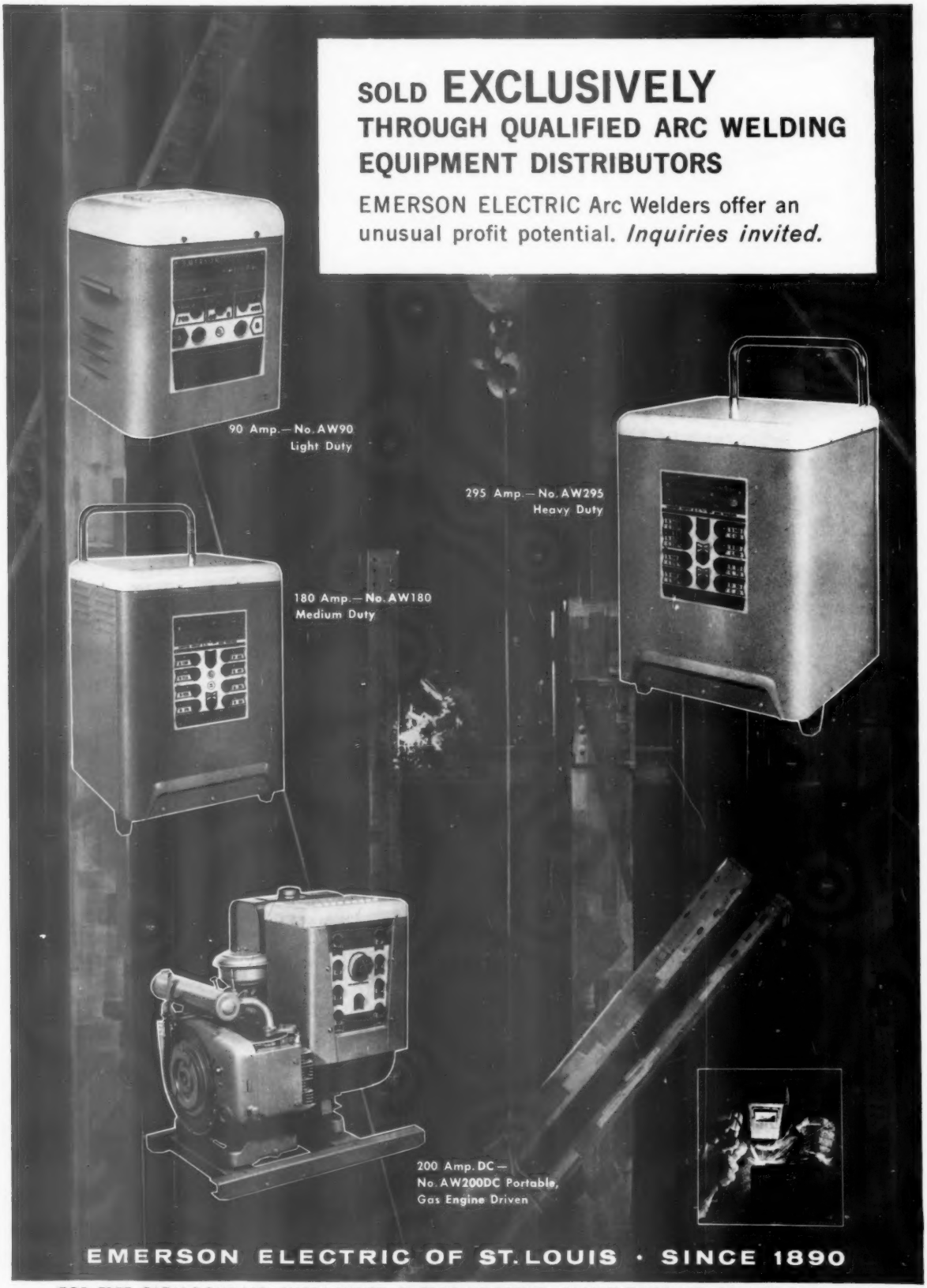
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